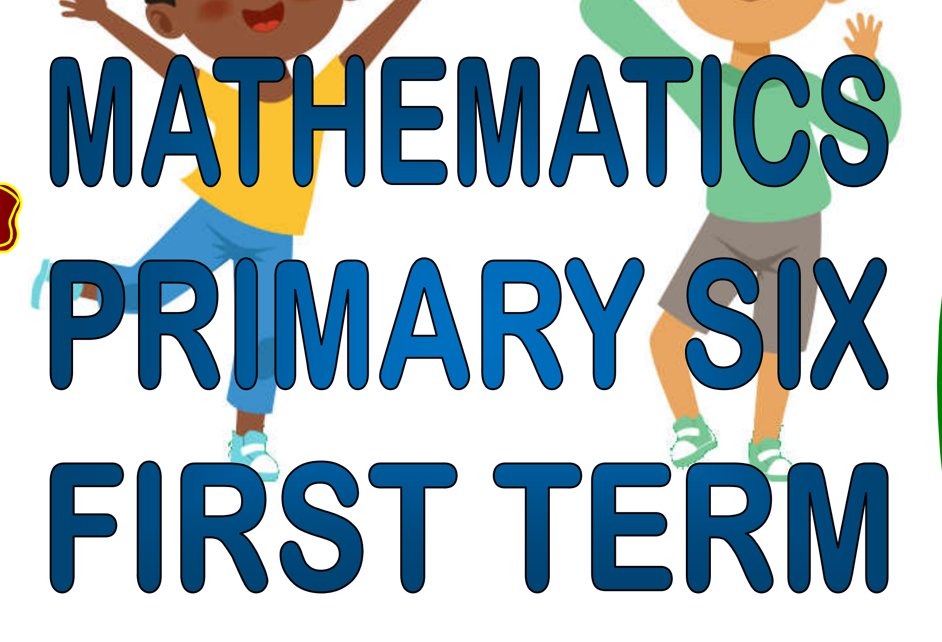


MATHEMATICS PRIMARY SIX FIRST TERM







Theme (1) | Number Sense and Operations Expressions and Equations

Unit (1) | Division, Factors, and Multiples

Concept (1) | Use Standard Algorithm for Division, Solve Problems with GCF and LCM

Unit (2) | Rational Numbers

Concept (1) | Explore the Number Line

Concept (2) | Investigating Rational Numbers

Concept (3) | Interpret and Use Absolute Value

Unit (3) | Algebraic Expressions

Concept (1) | Use and Analyze Expressions

Concept (2) | Algebraic Expressions and Exponents

Unit (4) | Equations and Inequalities

Concept (1) | Write and Solve Equations and Inequalities

Theme (2) | Mathematical Operations and Algebraic Thinking Statistics and Data Analysis

Unit (5) | Dependent and Independent Variables

Concept (1) | Explore Relationships between Two Variables

Unit (6) | Data Distributions

Concept (1) | Applications on Collecting and Represent Data

Unit (7) | Measures of Center and Variation

Concept (1) | Exploring central tendency measurements and Dispersion




UNIT 1

Theme 1 | Number Sense and Operations: Expressions and Equations

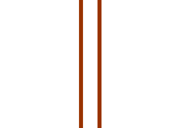
Division, Factors, and Multiples

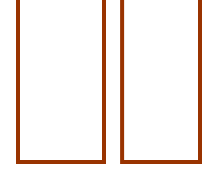
Concept (1)

Lesson (1) Using Long Division in the Real World

[1] Which situation involves division?

		Yes	No
(1)	78 volunteers at the food bank donated a total of 9,689 hours for the year. Each volunteer worked the same number of hours. How many hours did each volunteer donate to the food bank?		
(2)	The food bank can make one food box that can feed 1 person 3 meals per day for 2 weeks. How many total meals can one food box make?		
(3)	The food bank's top donor donated 1,250 tokens at each of 10 different fundraisers. How much money did the donor donate altogether?		
(4)	With the 6,982 can of food collected during the food bank's largest food drive, 93 meal boxes were created with the same number of cans in each box. In order for the food bank to use the most cans, how many would be in each box?		







[2] When you watch a cartoon, the frames of films seems to blend together to form a moving image. A cartoon lasting just 92 seconds requires 2,208 frames. How many frames do you see each second when you watch a cartoon?

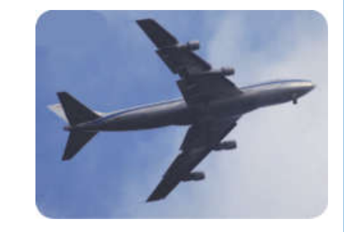


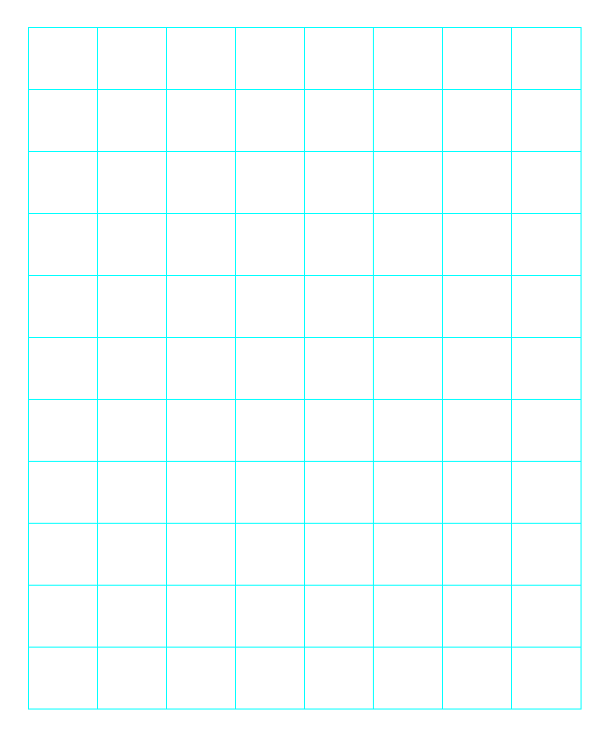
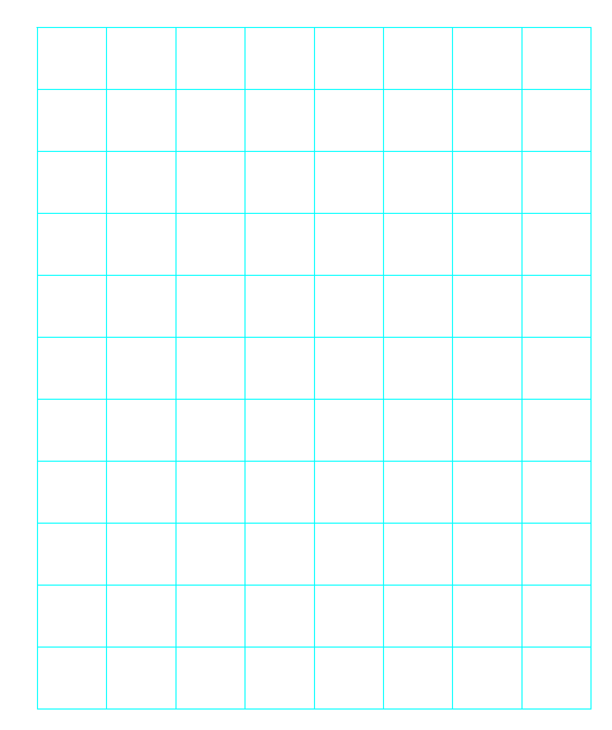


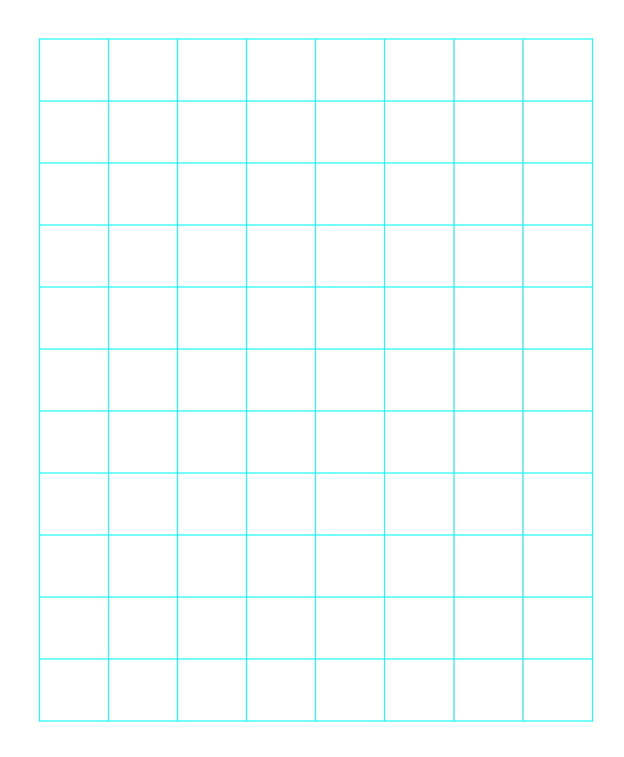
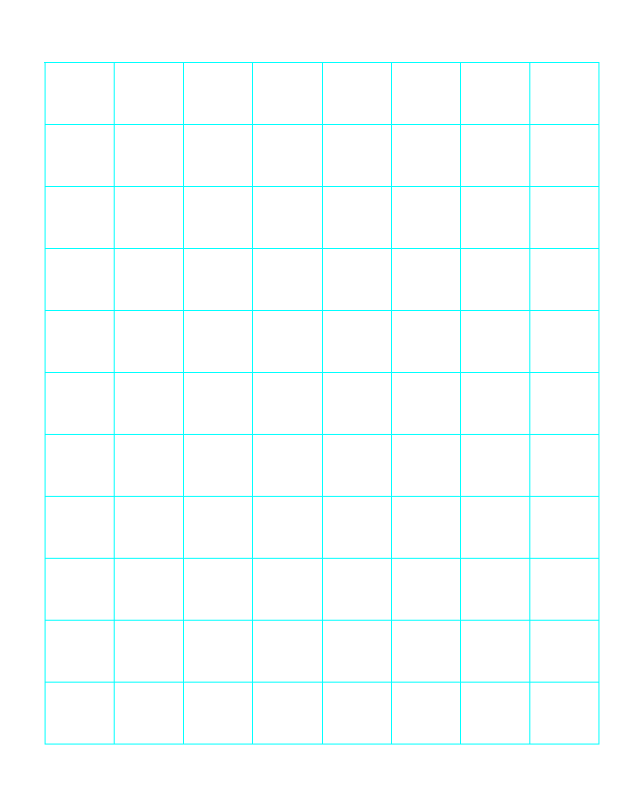
[3] A factory produces 30,480 cans in 12 hours. If the same number of cans is produced each hour, how many cans does the factory produce in one hour?



[4] An airplane has 298 seats. It carried 6,258 passengers last week, and all of its flights were full. How many flights did the plane make last week?




Homework

[1] Ali likes to take photos with his new camera; he took 427 photos in 15 days. How many photos did he take in each day?



[2] Hoda has 1,378 oranges and need to pack them up equally in 25 boxes. How many oranges in each box?

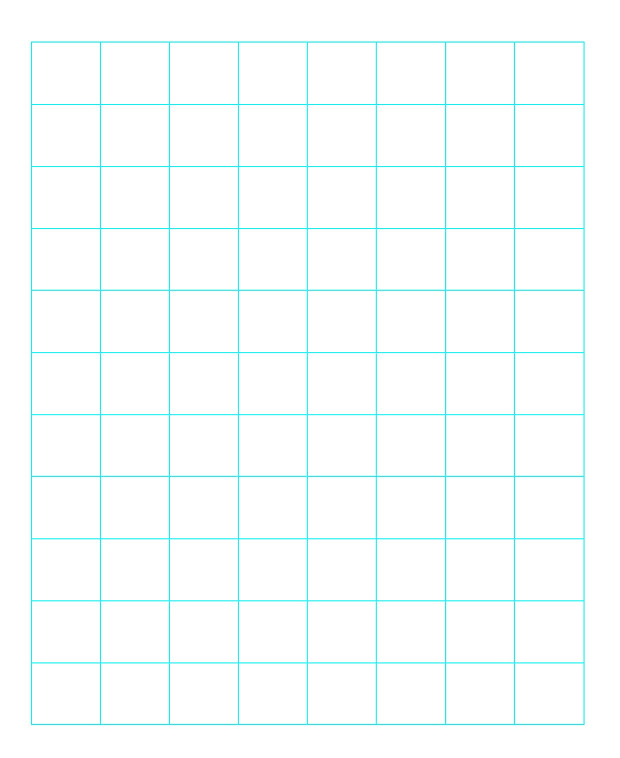
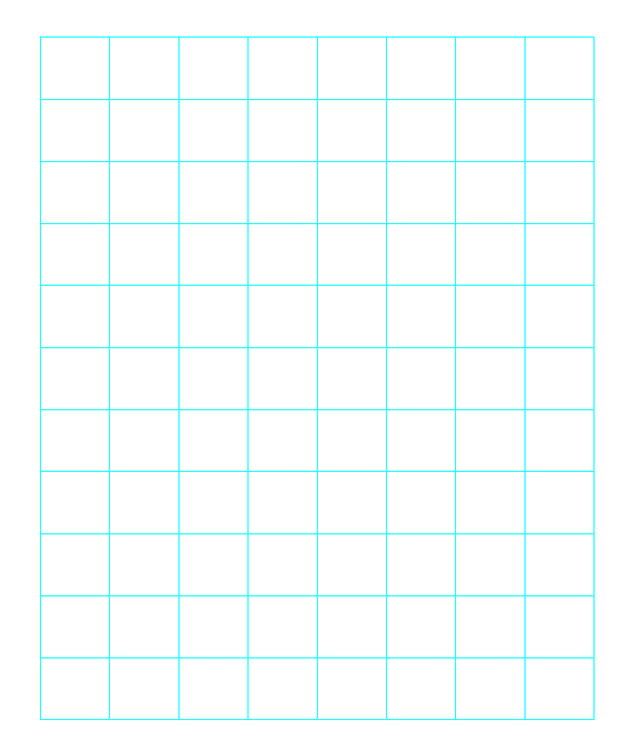


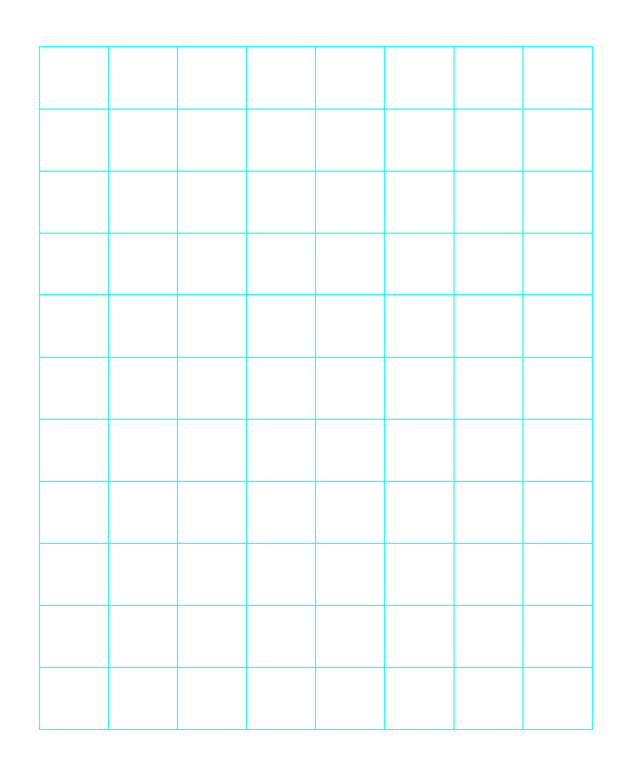
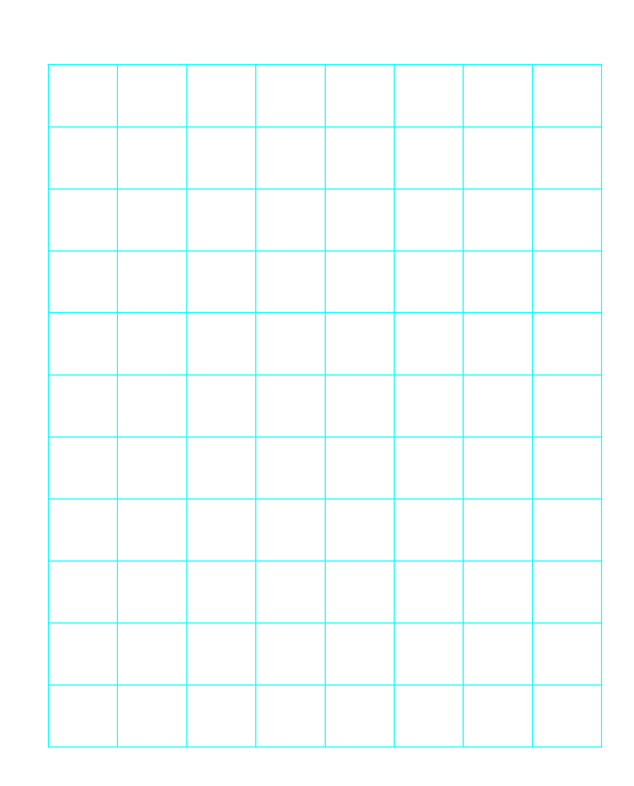
[3] A primary school is planning to a trip to the citadel of Salah Aldin. There are 464 students. If each bus has 45 seats, how many buses will be needed to move all the students?



[4] A Zookeeper wants to give each monkey an equal number of bananas. There are 37 monkeys in the Zoo and 567 bananas. How many bananas does each monkey get? How many bananas are left?



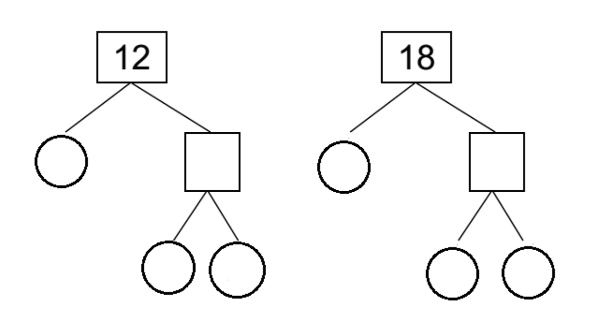



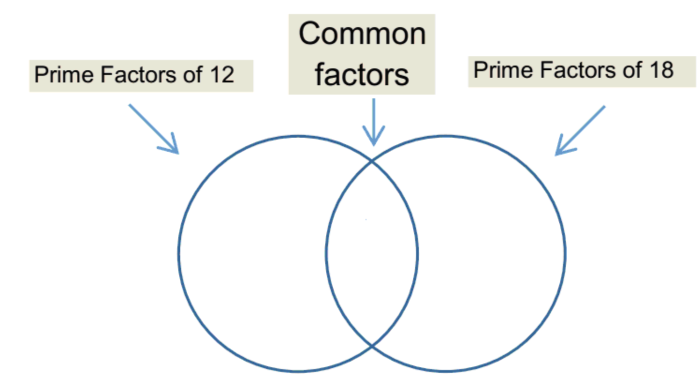




Lesson (2) Factorizing a Number to Its Prime Factors

[1] Find the GCF and LCM of the two numbers 12 and 18 using Venn diagram:

Venn diagram





12 = ... × ...... × ......

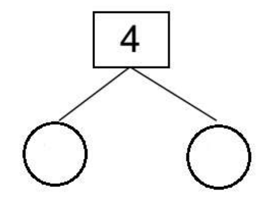
18 = ... × ...... × ......

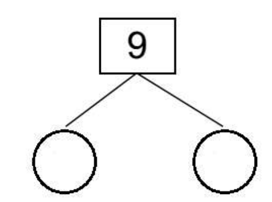
GCF = ...

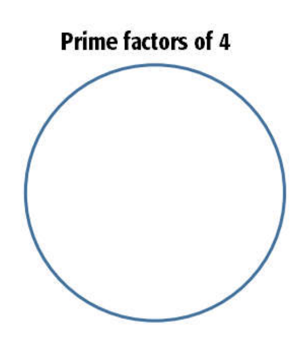
LCM = ...

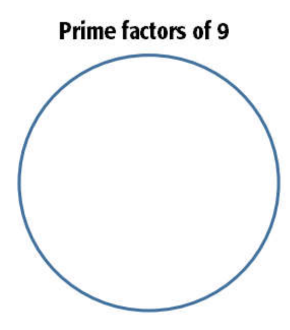


[2] Find the GCF and LCM of the two numbers 4 and 9 using Venn diagram:









4 = ... × ......

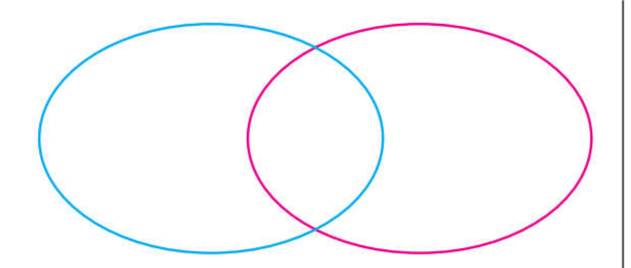
9 = × ...... × ......

GCF = ...

LCM = ...



[3] Find the GCF and LCM of the two numbers 16 and 20 using Venn diagram:



GCF = ...

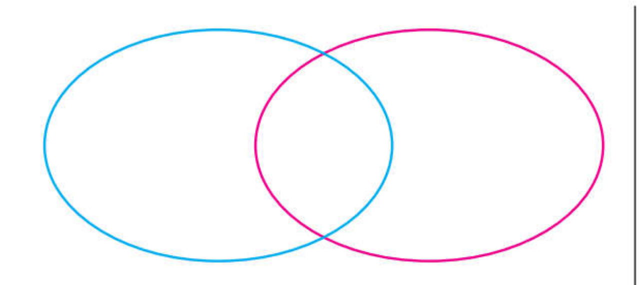
LCM = ...

16 = ...

20 = ...



[4] Find the GCF and LCM of the two numbers 24 and 36 using Venn diagram:



GCF = ...

LCM = ...

24 = ...

36 = ...



Definition:

Relatively Prime Numbers: are numbers whose only common factor is 1.



Remarks:

[1] The common factor of all numbers is 1.

[2] The common Multiple of all numbers (except zero) is zero.

[3] The LCM for any relatively prime numbers is their product.



[3] For two relatively prime numbers, which of the following is true?

		Yes	No
(1)	If there is no common factors in the intersection, the GCF is 0		
(2)	If there is no common factors in the intersection, the GCF is 1		
(3)	The LCM is the product of the two numbers		
(4)	The LCM is the product of all prime factors in the Venn diagram		

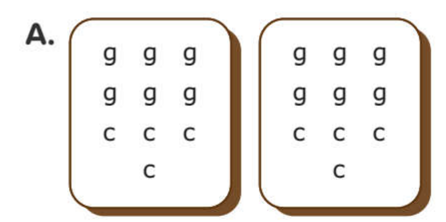




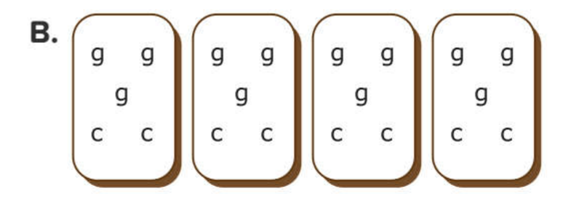
Lesson (3) Writing Expressions Using the GCF

[1] Ahmed has collected 12 grain bags and 8 packs of cheese in order to make donation boxes for the needy. Help Ahmed to determine the greatest number of boxes he could make so that all boxes include the same number of items. Let **g** stand for grain bag and **c** stand for a pack of cheese. You can represent this information with an expression.

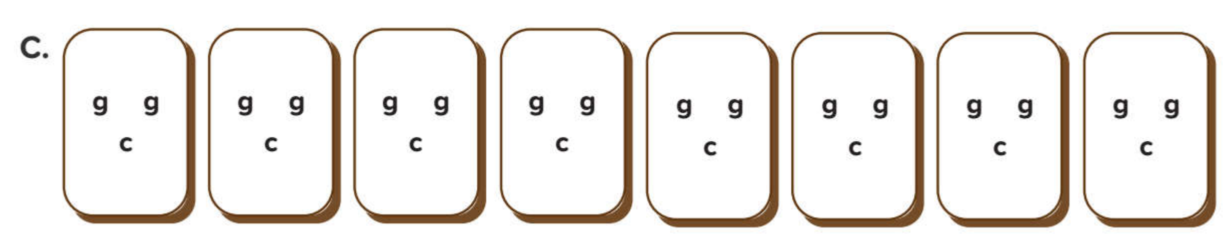
A.



B.



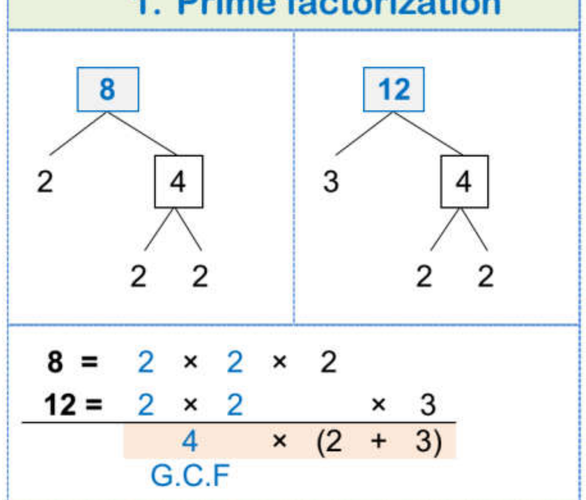
C.



Which expression represents the total number of items that Ahmed put into his boxes? Identify all that apply.

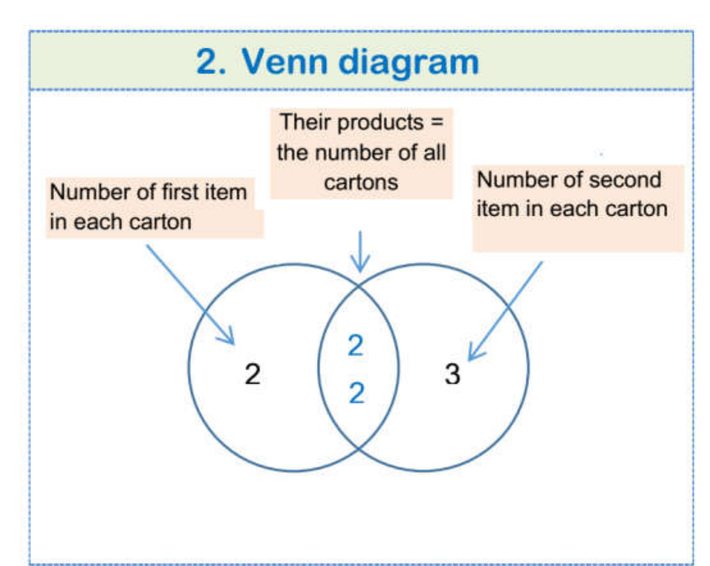
a. $4 + 3 + 2$ **b.** $(4\times3) + (4\times2)$ **c.** $4\times(3+2)$ **d.** $4 + (3\times2)$

1. Prime factorization



8 = 2 × 2 × 2
12 = 2 × 2 × 3
4 × (2 + 3)
G.C.F

2. Venn diagram





[2] **Students have collected 36 packs of cheese and 48 grain bags to make baskets. What is the largest number of baskets can be prepared with no items left over? And each basket will have the same number of packs of cheese and the same number of grain bags.**

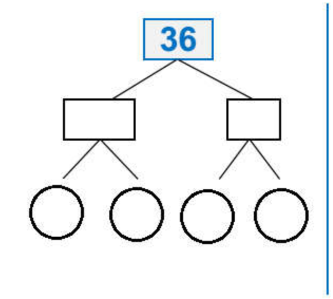
Sol:

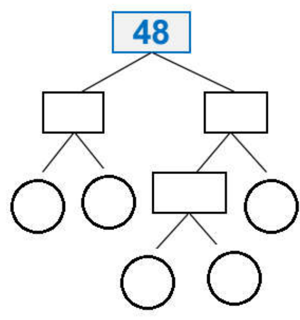
36 = × × ×

48 = × × × ×

= × (+)

= (×) + (+)







[1] **Ali has 48 pencils and 18 crayons. What is the numerical expression of the greatest number of sets that can be formed so that all sets have the same number of items?**

....

....

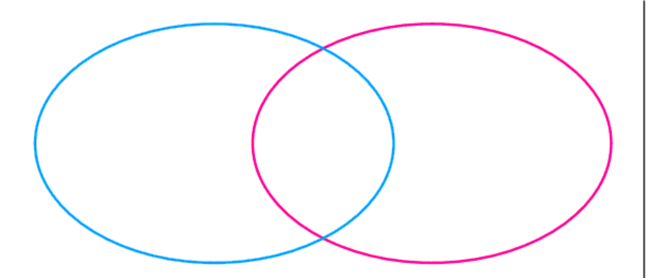
....

....



[2] Find the GCF and LCM for each pair of numbers using Venn diagram

a. 18 and 24



GCF = ...

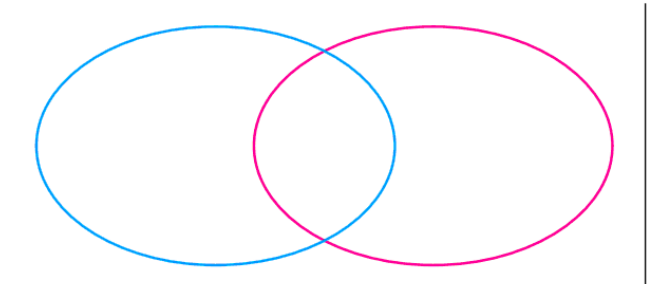
LCM = ...

18 = ...

24 = ...



b. 20 and 30



GCF = ...

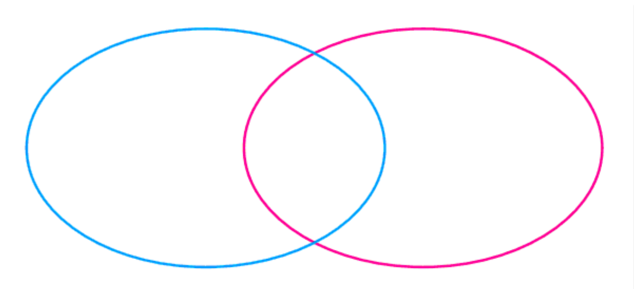
LCM = ...

20 = ...

30 = ...



c. 6 and 15



GCF = ...

LCM = ...

6 = ...

15 = ...

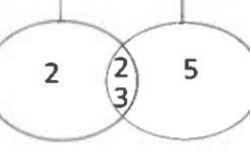
From the opposite Venn diagram

x = ...

y = ...

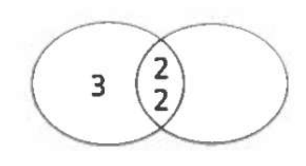
The expression : .... (.......... + ...)

represent the sum of x and y using distributive property





From the opposite Venn diagram represent the prime factors of two number.
The expression that represent the addition of two number is ....



A. 4 (3 + 4) B. 3 (4 + 1) C. 4 (3 + 1) D. 3 (2 + 2)



5 (2 + ...) = 10 + 35

A. 5 B. 7 C. 2 D. 8



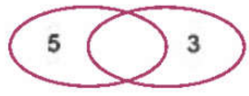
9 (1 + 2) = 9 + ...

A. 9 B. 81 C. 18 D. 27



In the opposite Venn diagram the L.C.M is ....

A. 0 B. 1 C. 15 D. 8



Which of the following are relatively prime numbers ? ....

A. 4 and 8 B. 12 and 18 C. 2 and 12 D. 9 and 4



In the opposite venn diagram the G.C.F is ....

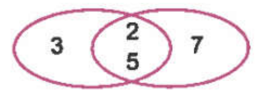




From the opposite Venn diagram , the expression is ....

A. 10 (6 + 35) B. 3 (10 + 7)

C. 7 (10 + 3) D. 10 (3 + 7)



Lesson (4) Analyzing least Common Multiples

[1] Find the result:

(1) $1 + \frac{2}{9} =$ ....

(2) $\frac{1}{5} + \frac{4}{5} =$ ....

(3) $\frac{3}{11} + \frac{7}{11} =$ ....

(4) $\frac{3}{5} + \frac{1}{5} =$ ....

(5) $\frac{2}{7} + \frac{6}{7} =$ ....

(6) $2\frac{3}{8} + 1\frac{7}{8} =$ ....

(7) $\frac{6}{11} + \frac{6}{11} =$ ....

(8) $\frac{1}{4} + \frac{2}{4} =$ ....

(9) $\frac{7}{8} - \frac{3}{8} =$ ....

(10) $\frac{3}{5} - \frac{1}{5} =$ ....

(11) $3\frac{5}{6} - 1\frac{1}{6} =$ ....

(12) $3 - \frac{3}{4} =$ ....

(13) $5\frac{3}{7} - \frac{6}{7} =$ ....

(14) $5 - 1\frac{2}{7} =$ ....

(15) $5\frac{2}{5} - 1\frac{4}{5} =$ ....

(16) $1 - \frac{3}{5} =$ ....

(17) $\frac{1}{8} + \frac{1}{5} =$ ....

(18) $\frac{3}{7} + \frac{2}{5} =$ ....

(19) $2\frac{1}{3} + 1\frac{1}{2} =$ ....

(20) $\frac{1}{4} + \frac{1}{12} =$ ....

(21) $1\frac{3}{5} + \frac{1}{3} =$ ....

(22) $\frac{7}{10} + \frac{5}{6} =$ ....

(23) $\frac{3}{4} + \frac{4}{5} =$ ....

(24) $\frac{1}{4} + \frac{2}{3} =$ ....

(25) $\frac{5}{6} - \frac{3}{8} =$ ....

(26) $\frac{1}{4} - \frac{1}{5} =$ ....

(27) $1\frac{1}{12} - \frac{5}{9} =$ ....

(28) $\frac{5}{6} - \frac{1}{2} =$ ....

(29) $\frac{5}{6} - \frac{7}{12} =$ ....

(30) $6\frac{4}{5} - 2\frac{1}{4} =$ ....

(31) $\frac{3}{4} - \frac{2}{3} =$ ....

(32) $\frac{5}{7} - \frac{2}{3} =$ ....



Homework

[1] Choose the correct answer:

(1) $\frac{5}{6} - \frac{3}{5}$ = ...

ⓐ $\frac{7}{30}$ ⓑ $\frac{8}{30}$ ⓒ $\frac{9}{30}$ ⓓ $\frac{1}{3}$

(2) The equivalent fraction to $\frac{12}{15}$ is ....

ⓐ $\frac{2}{5}$ ⓑ $\frac{3}{4}$ ⓒ $\frac{4}{5}$ ⓓ $\frac{1}{3}$

(3) $\frac{5}{8}$ + ... = 1

ⓐ $\frac{1}{8}$ ⓑ $\frac{3}{8}$ ⓒ $\frac{5}{8}$ ⓓ $\frac{7}{8}$

(4) $2\frac{3}{4} + 1\frac{2}{3}$ = ...

ⓐ $3\frac{5}{12}$ ⓑ $4\frac{5}{12}$ ⓒ $\frac{17}{12}$ ⓓ 4

(5) A student has collected 20 packs of cheese and 40 grain bags to make food boxes. He uses the expression 10(2 + 4) to represent how many boxes he could make with equal amounts of food in each box. His friend tells him that there is another way to make more boxes. Which one is correct?

ⓐ 20 (2 + 4) ⓑ 10 (1 + 2) ⓒ 10 (1 + 4) ⓓ 20 (1 + 2)





Unit (1) Assessment

[1] Choose the correct answer:

(1) If 384 ÷ 16 = 24, then the dividend is ....

a) 384　b) 16　c) 24　d) 0

(2) If 40 ÷ 5 = 8, then the remainder is ....

a) 40　b) 5　c) 8　d) 0

(3) If 29 ÷ 3 = 9 R2, then the divisor is ....

a) 29　b) 3　c) 9　d) 2

(4) The GCF of 6 and 8 is ....

a) 1　b) 2　c) 3　d) 4

(5) The common factor of all numbers is ....

a) 0　b) 1　c) 2　d) 3

(6) The GCF of any two relatively prime numbers is ....

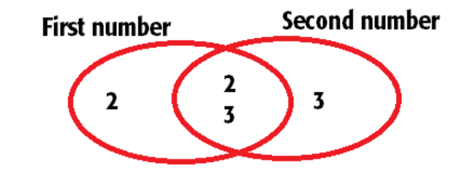
a) 0　b) 1　c) 2　d) 3

(7) The common multiple of all numbers (except zero) is ....

a) 0　b) 1　c) 2　d) 3



[2] From the opposite Venn diagram, Complete:



(1) The GCF of the two numbers is ....

(2) The LCM of the two numbers is ....

(3) The first number is ....

(4) The second number is ....



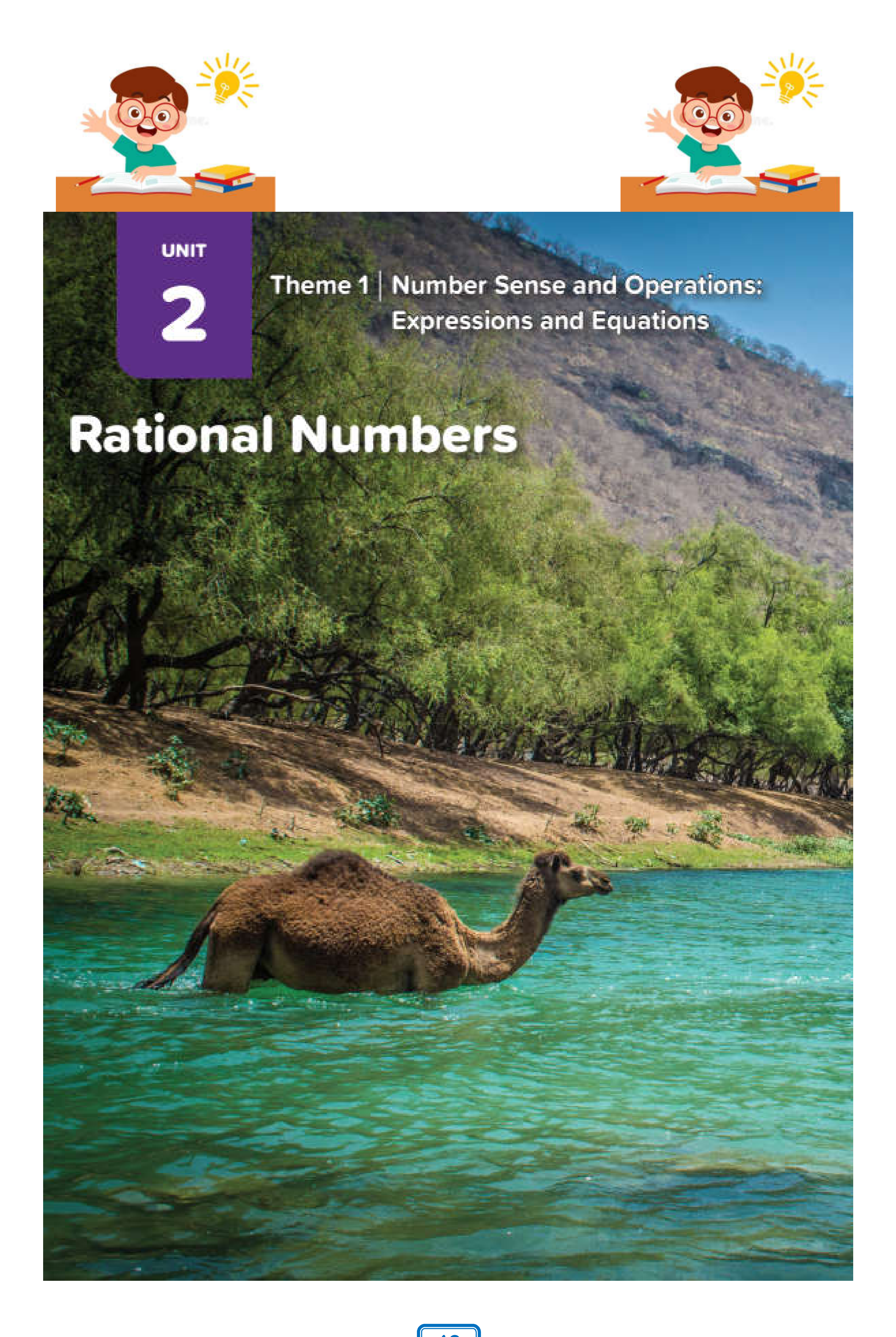
[3] Essay Problems:

(1) Salma bought $3\frac{1}{2}$ kg of tomatoes and $1\frac{1}{4}$ kg of onions. How many kilograms of vegetables did she buy?

....

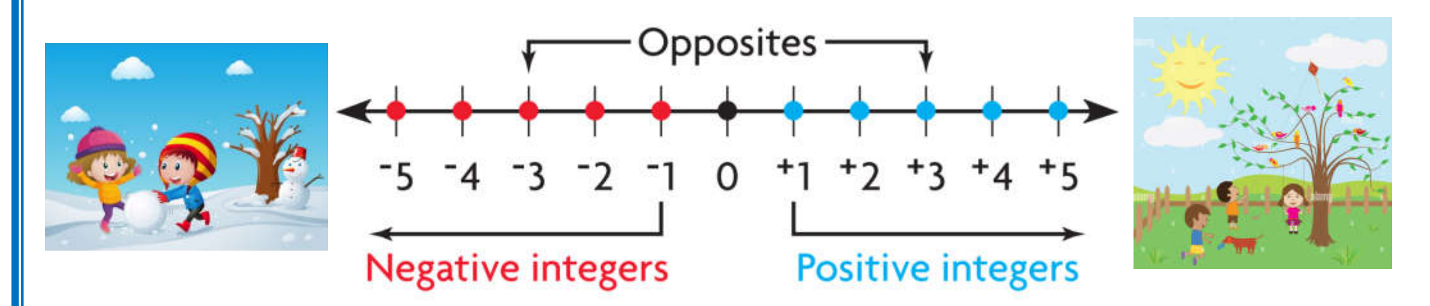
(2) Ali bought a bottle of juice contains $1\frac{1}{2}$ liters. He drank $\frac{2}{5}$ Liters. How many liters of juice were left?

....


UNIT
2
Theme 1 | Number Sense and Operations:
Expressions and Equations
Rational Numbers

Concept (1)

Lesson (1) Using a Number Line to Describe Data



Integers are the set of all whole numbers and their opposites. Two numbers are **opposite** if they are the same distance from 0 on the number line on different sides of 0. For example, the integers **+3** and **-3** are opposites. **Zero** is its **own opposites**.

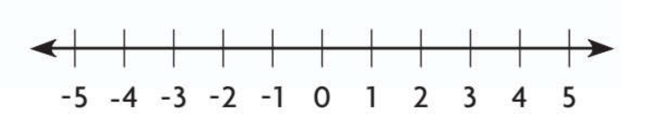


[1] Graph each integer and its opposite on a number line:

A 2

The integer 2 is on the ______ side of 0.

Graph the opposite of 2 at ______.

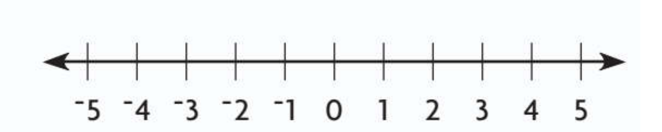


So, the opposite of 2°C is ______.

B −4

The integer −4 is on the ______ side of 0.

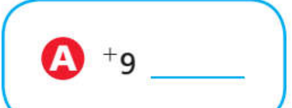
Graph the opposite of −4 at ______.

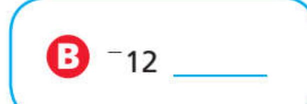


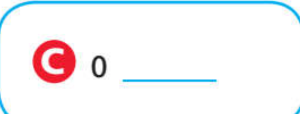
So, the opposite of −4°C is ______.



[2] Write the opposite of the integer:









[3] Represent the following data on the number line, then order them from lowest to highest:

	Liquid	Freezing Point (°C)
A	Corn Oil	-20
E	Fresh Water	0
M	Sea Water	-2
D	Peanut Oil	3
H	Orange Juice	-6

Lowest	⟶	⟶	⟶	Highest



[4] Write an integer number to represent each situation:

(1) A tree is 4 m tall. (..............................)

(2) A bank deposit of L.E. 700 (..............................)

(3) Ali withdraws 500 pounds from his bank accountant. (..............................)

(4) A loss of L.E. 2000 (..............................)

(5) A profit of L.E. 5000 (..............................)

(6) A gain of 8 points. (..............................)

(7) A temperature is 5 °C above zero. (..............................)

(8) A temperature is 4 °C below zero. (..............................)

(9) 50 m above sea level. (..............................)

(10) 13 m below sea level. (..............................)

(11) He is diving 3 m deep. (..............................)

(12) A weight loss of 3 kg. (..............................)

(13) A decrease of L.E. 600 (..............................)

(14) An increase of L.E. 900 (..............................)

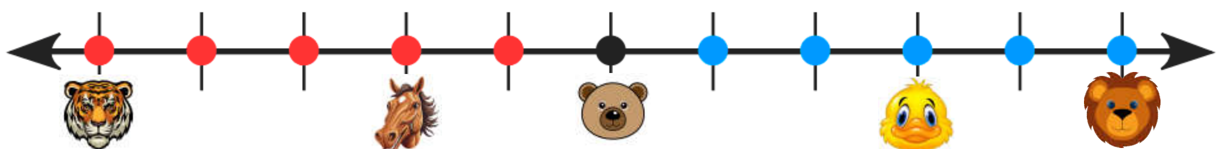
(15) 3 steps forward. (..............................)

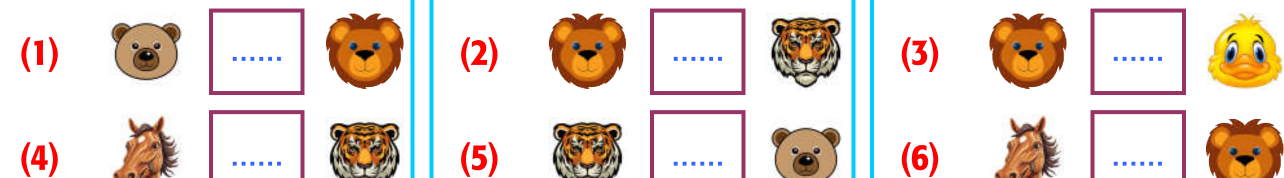
(16) 5 steps backward. (..............................)



Lesson (2) Using a Number Line and Symbols to Compare Numbers

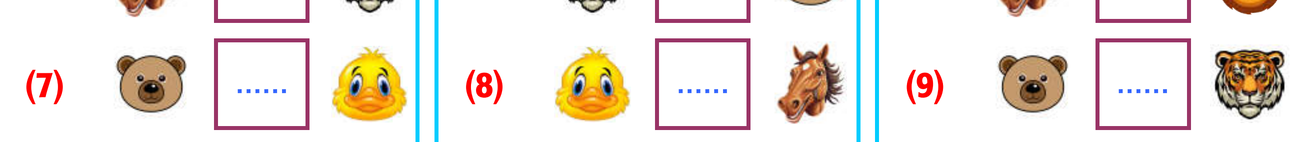
[1] Look at the following number line, then complete using (<) or (>):



(1) ...... (2) ...... (3) ......

(4) ...... (5) ...... (6) ......



(7) ...... (8) ...... (9) ......



[2] Complete using (<) or (>):

(1)	-5 0		(2)	25 ...... -15		(3)	60 40		(4)	12 10	
(5)	4 ...... -5		(6)	19 18		(7)	-6 ...... -3		(8)	75 90	
(9)	-3 ...... -2		(10)	83 59		(11)	-41 43		(12)	87 ...... -87	



[3] Order each set of integers from least to greatest:

(1)	14	2	11	8	9	......	......	......	......	......
(2)	-50	167	-240	34	95	......	......	......	......	......
(3)	-68	-113	2	89	-90	......	......	......	......	......
(4)	7	80	-5	2	100	......	......	......	......	......
(5)	-90	9	16	25	-900	......	......	......	......	......





[4] Complete:

(1) The Greatest negative integer is ....

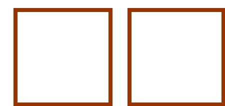
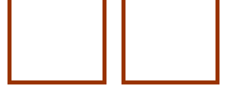
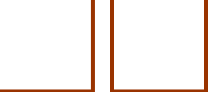
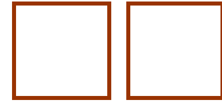
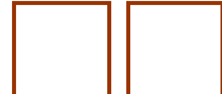
(2) The smallest positive integer is ....

(3) The smallest non-negative integer is ....

(4) The greatest non-positive integer is ....



[5] Tick (✓) under Yes or No:

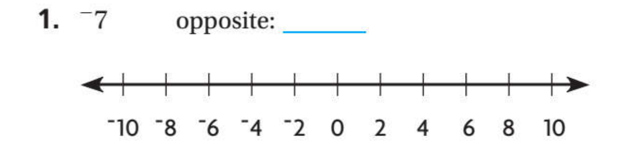
		Yes	No
(1)	A number and its opposite are the same distance away from zero on a number line but on opposite sides.		
(2)	All opposites are negative numbers.		
(3)	Zero is its own opposite.		
(4)	To show 5 and its opposite on a number line, count 5 units and plot the point 5 units to the right and to the left of 0.		
(5)	The opposite of an opposite is zero.		



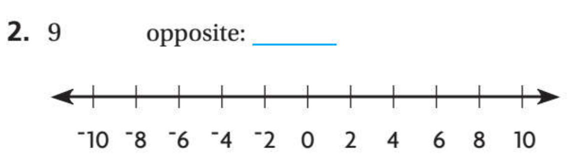
Homework

[1] Graph the integer and its opposite on a number line:

1. $^{-}7$ opposite: ______



2. 9 opposite: ______





[2] Write the opposite of each given number:

1. $-5 \longrightarrow$ ....
2. $6 \longrightarrow$ ....
3. $\frac{1}{2} \longrightarrow$ ....
4. $-16 \longrightarrow$ ....
5. $-\frac{3}{2} \longrightarrow$ ....
6. $-1 \longrightarrow$ ....

[3] Complete using (<), (>) or (=):

(1)	-80	......	80	(2)	6	......	5	(3)	-99	......	7
(4)	-8	......	0	(5)	-202	......	-252	(6)	12	......	8
(7)	-25	......	-20	(8)	75	......	85	(9)	4	......	-86




[4] Order each set of integers from least to greatest:

(1)	54	52	-2	-8	91	......	......	......	......	......
(2)	-70	22	-80	34	-96	......	......	......	......	......
(3)	-4	-13	2	-9	-30	......	......	......	......	......

[5] Complete the table :

	Previous	Number	Next		Previous	Number	Next
(1)	......	-7	......	(2)	......	7	......
(3)	......	0	......	(4)	......	-22	......
(5)	......	-20	......	(6)	......	85	......
(7)	......	5	......	(8)	......	-60	......
(9)	......	-4	......	(10)	......	45	......

[6] Write the next four integers:

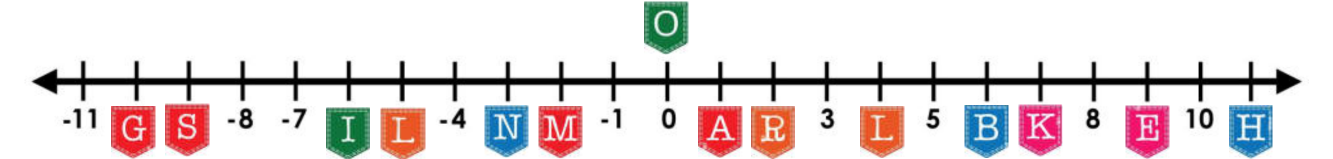
(1)	12	......	......	......	......
(2)	-50	......	......	......	......
(3)	-68	......	......	......	......
(4)	7	......	......	......	......

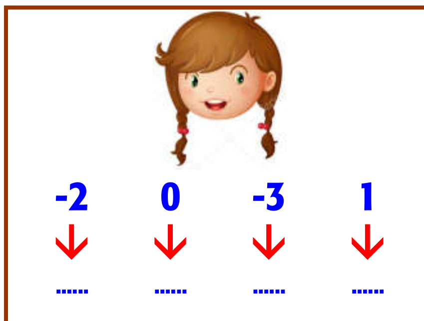
[7] Write the previous four integers:

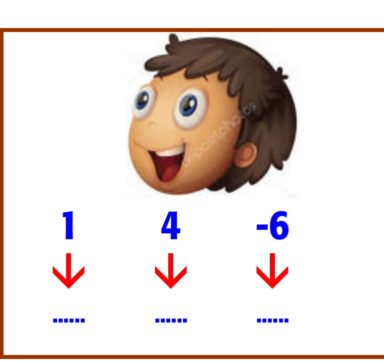
(1)	......	......	......	......	12
(2)	......	......	......	......	-50
(3)	......	......	......	......	-68
(4)	......	......	......	......	7

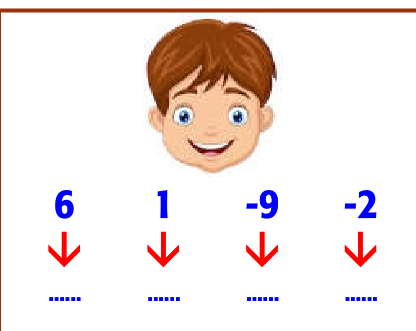


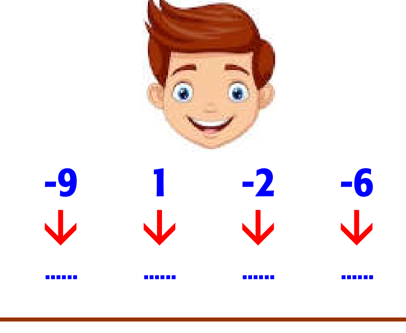
[8] Write the letter that represents each number to discover the name of each child:

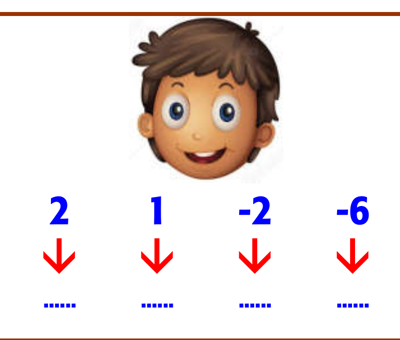


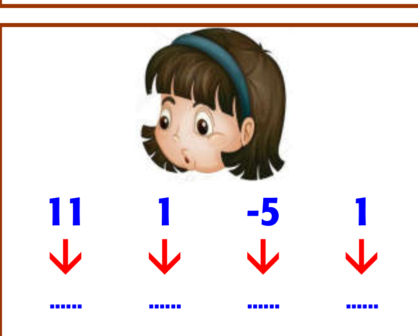












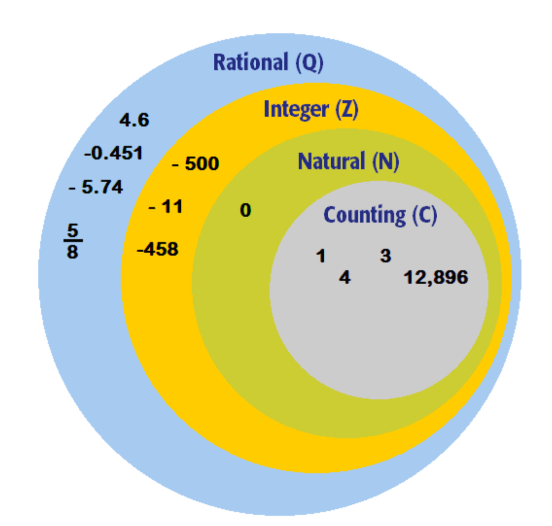


Concept (2)

Lesson (3) — Analyzing Rational Numbers by Using Models

[1] Place the following numbers into the opposite diagram where you think they fit best.

0.5	-7,605
-951	-5.47
78	822
$\frac{5}{11}$	$-3\frac{1}{4}$





[2] Match the numbers to the best description:

Rational numbers	Integer numbers	Counting numbers	Natural numbers

1. 0.585	2. -0.606	3. $\frac{1}{2}$ ....
4. 4	5. $6\frac{2}{3}$	6. 1 ....
7. -455	8. -11	9. 12,800 ....
10. 0	11. -28,765	12. 4.9 ....



[3] Tick (✓) under Yes or No:

	Statement	Yes	No
(1)	All integer numbers are also natural numbers.		
(2)	All natural numbers are also rational numbers.		
(3)	All rational numbers are also integer numbers.		
(4)	All natural numbers are also counting numbers.		
(5)	All integer numbers are also rational numbers.		
(6)	All rational numbers are also natural numbers.		



Remarks:

• $0.25 = \frac{1}{4}$	• $0.5 = \frac{1}{2}$	• $0.75 = \frac{3}{4}$	• $0.125 = \frac{1}{8}$
• $0.2 = \frac{1}{5}$	• $0.4 = \frac{2}{5}$	• $0.6 = \frac{3}{5}$	• $0.8 = \frac{4}{5}$



[4] Write the given rational numbers in fraction form $\frac{a}{b}$:

1. 4 ⟶ .... 2. 0.75 ⟶ .... 3. - 45 ⟶ ....

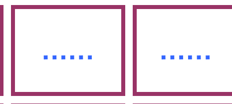
4. - 1.5 ⟶ .... 5. - 2.5 ⟶ .... 6. 0.125 ⟶ ....



Lesson (4) Comparing and Ordering Rational Numbers

[1] Order the given set of numbers from least to greatest:

(1)	2.1	1.4	$-3\frac{1}{4}$	$-1\frac{7}{8}$	$-2\frac{1}{2}$	......	......	......	......	......
(2)	3.7	$-3\frac{3}{5}$	$-4\frac{1}{3}$	0	$-5\frac{1}{2}$	......	......	......	......	......
(3)	$-7\frac{1}{5}$	4	$-9\frac{3}{8}$	$-2\frac{1}{3}$	2	......	......	......	......	......





[2] Write a number that is between each pair of numbers:

A. 3.75 and 3.76 ....

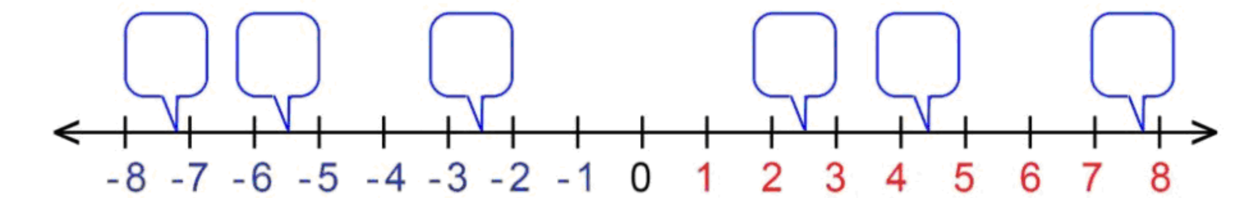
B. -9.1 and -9 ....

C. $\frac{1}{9}$ and $\frac{2}{9}$ ....

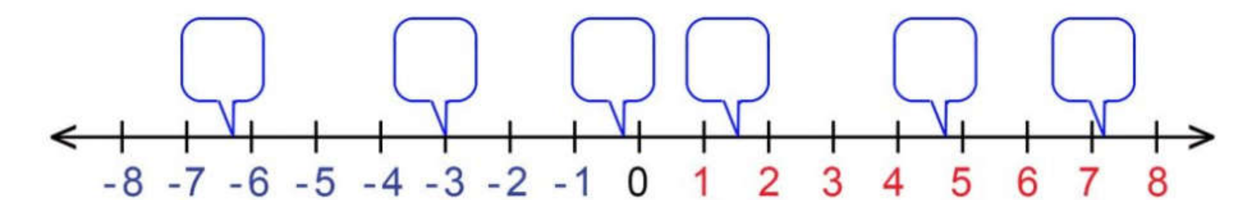
D. $-\frac{3}{4}$ and $-\frac{1}{2}$ ....

[3] Put each number in its suitable place on the number line:

(1) $4\frac{1}{2}$ 2.5 $-2\frac{1}{3}$ -7.25 -5.5 $7\frac{3}{4}$



(2) -3 1.5 $\frac{-3}{8}$ $-6\frac{1}{4}$ $4\frac{2}{3}$ 7.2





[4] Choose the correct answer:

(1) The represented number on the opposite number line is ....

(-8, -7, -6, -5, -4, -3)

ⓐ $4\frac{2}{3}$ ⓑ $5\frac{2}{3}$ ⓒ $-4\frac{2}{3}$ ⓓ $-5\frac{2}{3}$

(2) The represented number on the opposite number line is ....

(-3, -2, -1, 0, 1, 2, 3)

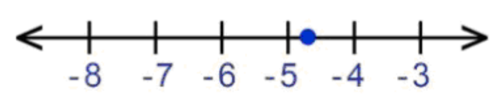
ⓐ 0.5 ⓑ 1.5 ⓒ -0.5 ⓓ -1.5



Homework

[1] Choose the correct answer:

(1) The represented number on the opposite number line is ....



a) $4\frac{1}{2}$ b) $5\frac{1}{2}$ c) $-5\frac{1}{3}$ d) $-4\frac{5}{6}$

(2) The number (-2) is .... number.

a) a natural b) a counting c) an odd d) an integer

(3) All integer numbers are .... numbers.

a) a natural b) a counting c) an even d) a rational

(4) The opposite of the number (-5) is ....

a) 5 b) -5 c) $\frac{1}{5}$ d) $\frac{-1}{5}$

(5) The rational number $-2\frac{2}{3}$ lies between the two integers .... and ....

a) 2 , 3 b) 1 , 2 c) -2 , -3 d) -1 , -2



[2] Complete:

(1) The additive inverse of 5.9 is ....

(2) The rational number -5.6 lies between the two integers .... and ....

(3) All natural numbers are .... numbers and .... numbers.

(4) The number -2.5 = ... (in the form $\frac{a}{b}$).

(5) The rational number $-2\frac{1}{4}$ = ... (in the decimal form).



[3] Order the given set of numbers from least to greatest:

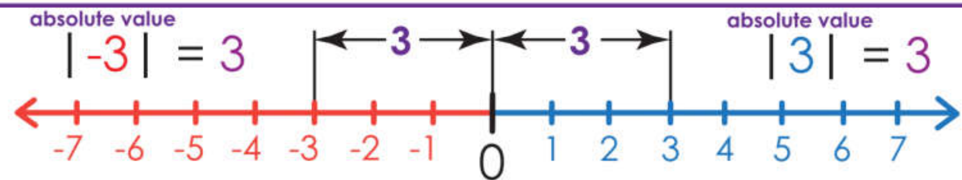
7.7	7	-3.8	$7\frac{1}{2}$	$-3\frac{1}{5}$	......	......	......	......	......



Concept (3)

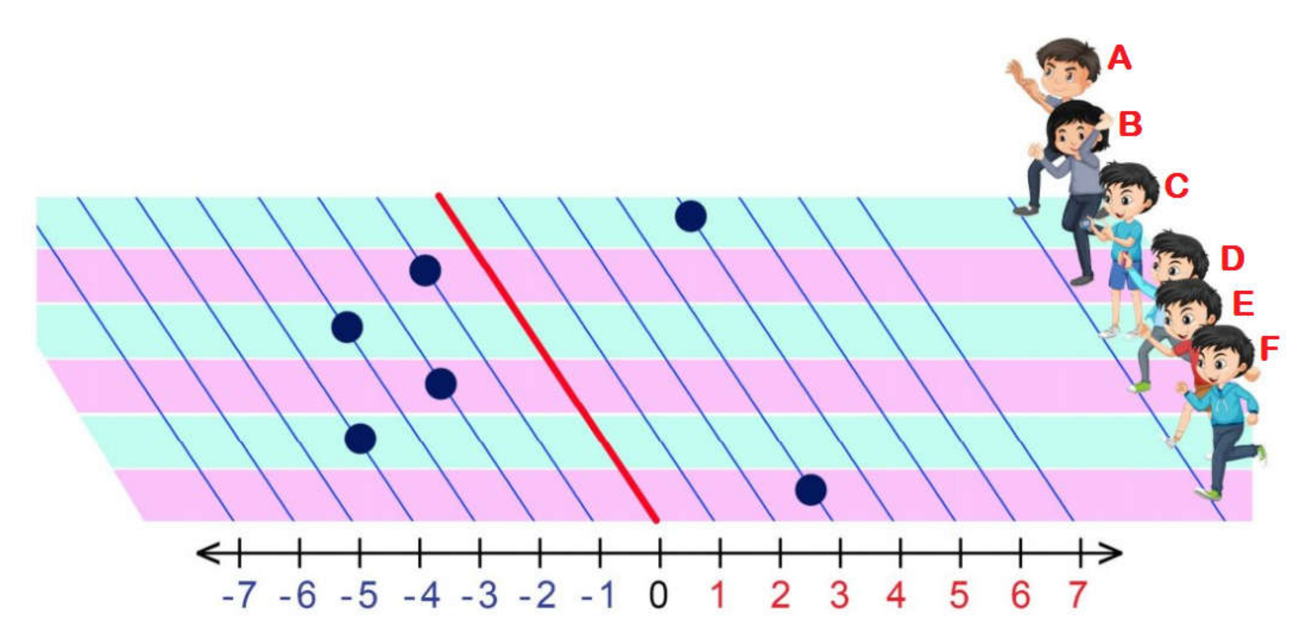
Lesson (5)	Exploring Absolute Value
Lesson (6)	Comparing Absolute value





How far a number is from zero. (Same as magnitude)







[1] Complete using (<) , (>) , or (=):

(1) $|-4|$ ...... $|-3|$

(2) -1.4 ...... $|-1.4|$

(3) $\left|9\frac{3}{5}\right|$ ...... $\left|-9\frac{3}{4}\right|$

(4) $|-8.2|$ ...... -7.9

(5) $5\frac{5}{6}$ ...... $\left|-\frac{35}{6}\right|$

(6) $|-2.71|$ 2.7



[2] Read the passage carefully, and then answer:

The elevations of several ponds are given. Complete the table to order the elevations from closest to sea level to farthest from sea level.

Pond	Elevation (in meters)
A	-28
B	-430
C	33
D	89
E	-214

Closest to sea level		$\longrightarrow$	Farthest from sea level	



[3] Complete:

1. $|-15| =$ ....
2. $|-5| =$ ....
3. $|6| =$ ....
4. $\left|-5\frac{1}{2}\right| =$ ....
5. $\left|2\frac{3}{7}\right| =$ ....
6. If $|m| = 10$, then $m =$ .... or ....
7. If $k = |-6.6|$, then $k =$ ....
8. If $n = |15|$, then $n =$ ....
9. Which is closest to zero -2.5 or 0.7 ? ....

[4] Order the given set of numbers from least to greatest:

(1)	2.5	-3.4	$\lvert-5.3\rvert$	-4	$\lvert0.8\rvert$	......	......	......	......	......
(2)	8	-17	$\lvert-3\rvert$	-9	$\lvert12\rvert$	......	......	......	......	......
(3)	$\frac{3}{4}$	$\frac{-5}{8}$	$\left\lvert\frac{-1}{2}\right\rvert$	$\frac{-5}{4}$	$\left\lvert\frac{1}{4}\right\rvert$	......	......	......	......	......

Homework

[1] Complete using (<) , (>) , or (=):

(1)	-0.7	......	$\lvert -0.7 \rvert$	(2)	$\lvert -9 \rvert$	......	$\lvert -8 \rvert$	(3)	$\left\lvert \frac{-7}{9} \right\rvert$	......	$\frac{-7}{8}$
(4)	5.7	......	$\lvert -5.7 \rvert$	(5)	$\left\lvert \frac{2}{3} \right\rvert$	......	$\left\lvert -\frac{1}{3} \right\rvert$	(6)	$\lvert 3.4 \rvert$	......	$\lvert -3.4 \rvert$
(7)	$\left\lvert 3\frac{1}{4} \right\rvert$	......	$\left\lvert -7\frac{2}{5} \right\rvert$	(8)	$\left\lvert -2\frac{3}{4} \right\rvert$	......	$-\left\lvert 4\frac{2}{3} \right\rvert$	(9)	$\left\lvert \frac{-8}{3} \right\rvert$	......	$2\frac{2}{3}$

[2] Complete:

1. If $|a| = 5$, then $a =$ .... or ....
2. If $b = |-7|$, then $b =$ ....
3. If $n = |9|$, then $n =$ ....
4. $-|-5| =$ ....
5. $-|4| =$ ....
6. $|3| + |-3| =$ ....
7. $|7| - |-7| =$ ....



[3] Choose the correct answer:

(1) $|-1.5| =$ ....

ⓐ 1.5 ⓑ -1.5 ⓒ 15 ⓓ -15

(2) $|6| =$ ....

ⓐ 6 ⓑ -6 ⓒ 3 ⓓ -3

(3) The absolute value of the number 2.7 is ....

ⓐ -2.7 ⓑ 2.7 ⓒ 27 ⓓ -27

(4) The absolute value of zero is ....

ⓐ 10 ⓑ 0 ⓒ -1 ⓓ 1

Unit (2) Assessment

[1] Choose the correct answer:

(1) The number -7 is located to the right of the number ……… on the number line.

ⓐ -8 ⓑ 8 ⓒ -6 ⓓ 6

(2) The number ………… is neither negative nor positive.

ⓐ 0 ⓑ 1 ⓒ -1 ⓓ 10

(3) The smallest non-negative integer is …………

ⓐ -1 ⓑ 1 ⓒ 100 ⓓ 0

(4) -0.3 = ………… (in the form $\frac{a}{b}$)

ⓐ $\frac{10}{3}$ ⓑ $\frac{-3}{1}$ ⓒ $\frac{-1}{3}$ ⓓ $\frac{-3}{10}$

(5) |-3.7| = …………

ⓐ 3.7 ⓑ 37 ⓒ -3.7 ⓓ -37

(6) The absolute value of zero = …………

ⓐ 1 ⓑ 10 ⓒ 0 ⓓ -1

[2] Complete:

(3) The greatest non-positive integer is …………

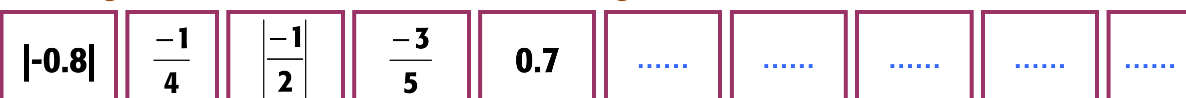
(4) The smallest positive integer is …………

(5) The integer that represents 7 °C below zero is …………

(6) The integer that comes just after -8 is …………

(7) If |a| = 8, then a = ………… or …………

[3] Order the given set of numbers from least to greatest:



[4] Complete using (<) , (>) , or (=):

(1) -3.8 …… -1.8

(2) $-3\frac{7}{8}$ …… $\left|-3\frac{5}{8}\right|$

(4) $\left|\frac{2}{5}\right|$ …… |-0.4|

(5) |-2.5| …… |-3.6|





UNIT 3

Theme 1 | Number Sense and Operations: Expressions and Equations

Algebraic Expressions

Concept (1): Use and Analyze Expressions

Lesson (1)	Creating Mathematical Expressions
Lesson (2)	Analyzing Mathematical Expressions

Variable & Constant:

The variable is a letter as: x or y or n or … represents any number. But the constant (absolute term) is a number such as 5 or 7 or 9 …..

Algebraic Term:

The algebraic term consists of the product of two factors or more.

For Example:

$$2x, 7y, 9m, 3xy, \ldots$$

Remarks:

(1) In algebraic term 7x the number 7 is called numerical factor or (coefficient) and x is called algebraic factor.

(2) The algebraic terms are said to be like terms if the algebraic symbols forming their factors are like and the indices (Powers) of these symbols are equal.

For Example:

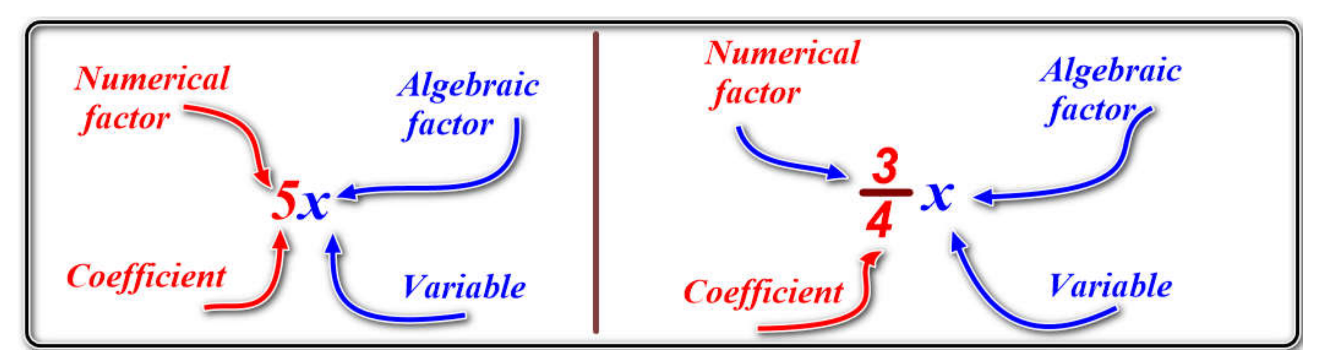
$3x^2$, $5x^2$ $-9x^2$ are like terms, also $4y$, $6y$, $-3y$ are like terms

Remark:

If an algebraic term consists of one algebraic factor, then the coefficient is 1 or -1.

For example:

- In the algebraic term "x" the coefficient is "1"
- In the algebraic term "-x" the coefficient is "-1"



Algebraic Expression:

The algebraic expression consists of one or more terms connected by the sign + or –

For Example:

$x + 2$, $3x - y$, $3mn - 7$,….

Learn:

Equation is a mathematical sentence that has two expressions separated by an equal sign (=). One or both expressions contains one unknown (or more)

For Example:

$x + 5 = 7$, $3m + n = 10$, $8xy = 15$

[1] Complete the following table:

	Algebraic term	Numbers of factors	Coefficient	Algebraic factors
1	$5xy$	3	5	x , y
2	$7m$			
3	$-5x$			
4	$\frac{3}{7}y$			
5	$8n$			
6	$\frac{2}{5}x$			



[2] Complete the following table:

	Mathematical expression	Numbers of terms	Coefficient	Algebraic factors
1	5x +3y	2	5 , 3	x , y
2	7 m - 6n			
3	4k - 5 x + 9			
4	$\frac{3}{7}$ y +10			
5	8 n - 4			
6	$\frac{2}{5}$ x + 8			



[3] Classify the following mathematical expressions into (numerical expression) or (algebraic expressions) but Tick ( ):

	Mathematical expression	Numerical expression	Algebraic expression
1	9 + 5 - 2	✓	
2	7 x + m		✓
3	-5 + 7+ 2		
4	2 x + 5 y – 2 z		
5	3 m – 2 n + 9		
6	3 (5 x + 2 y)		
7	3 x + 5 y + x + 6 y		
8	2 (1.8 + 0.6)		



[4] Complete the following table:

	Mathematical expression	Numbers of terms	Like terms
1	$3x + 2y - 5x$	3	$3x$, $-5x$
2	$3.5m + 1.7n$		
3	$6xy - 5k + 2xy$		
4	$5.7k + 4.2k$		
5	$4y + 5x - 4y + 9$		
6	$\frac{2}{5}m + \frac{2}{5}km + 6m$		
7	$1.3a + 2b + 5.7a$		



Homework

[1] Choose the correct answer:

(1) The algebraic expression $\frac{1}{5}$ k consists of …… factors.

ⓐ 1 ⓑ 2 ⓒ 3 ⓓ 4

(2) In the algebraic term 9 z y^2 the coefficient = …….

ⓐ 9 ⓑ 2 ⓒ 3 ⓓ 4

(3) The algebraic term -5 x z has ……. Factors.

ⓐ 1 ⓑ 2 ⓒ 3 ⓓ 4

(4) The number of terms that make up the algebraic expression (5 m + 2 n – 9) is ……

ⓐ 1 ⓑ 2 ⓒ 3 ⓓ 4

(5) The like terms in the algebraic expression (5 m + 2 n – 9 m + 2) are ……

ⓐ 2 n , 2 ⓑ 5 m , - 9 m ⓒ 5 m , 2 n ⓓ nothing



[2] Complete:

(1) The algebraic factor in the term 8.5 k^2 is ………………………

(2) The coefficient of algebraic term 5 x^2 y is ……………………

(3) The number of terms and the algebraic expression 3 m – 2 n + 8 is ……………

(4) Like terms in the algebraic expression 3 a + 2 b – 5 a + 9 are …………………

(5) The constant in the algebraic expression 5 k + 8 is …………………

(6) The number of variables in the algebraic expression 3x y +2 z +5 m is ……………

(7) The coefficients in the algebraic expression 5 k + 3 m – 8 are …………………

(8) Two numbers the sum of them is 10 if first one is "x" so the second one is ………..

(9) Ahmed and Tamer have 60 pounds if Ahmed has "x" pounds, then Tamer has ……………… pounds.



Lesson (3) Writing Algebraic Expressions

Examples for Addition:

(1) We can write (13 + n) to represent. 13 added to n.

(2) We can write (a + b) to represent. The sum of a and b .

(3) We can write (p + 10) to represent. p increased by 10 .

(4) We can write (x + 10) to represent . The total of x and IO.

(5) We can write (9 + m) to represent 9 plus m.



Examples for Subtraction:

(1) We can write (y - x) to represent subtract x from y .

(2) We can write (x - 7) to represent the difference between x and 7.

(3) We can write (m - 10) to represent 10 less than m.

(4) We can write (p - 11) to represent the p decreased by 11.

(5) We can write (p - 6) to represent p reduced by 6.

(6) We can write (x – y) to represent x exceeds y.



Examples for Multiplication:

(1) We can write (7y) to represent 7 times y

(2) We can write (x y) to represent the product of x and y.

(3) We can write (5) to represent 5 multiplied by y.

(4) We can write ($\frac{1}{5}x$) to represent one fifth of x.



Examples for Division:

(1) We can write (m ÷ 6 or $\frac{m}{6}$) to represent. m divided by 6

(2) We can write (x ÷ 6 or $\frac{x}{6}$) to represent. Divide x by 6

(3) We can write (x ÷ 7 or $\frac{x}{7}$) to represent. 7 divides x.

(4) We can write (x ÷ 9 or $\frac{x}{9}$) to represent. quotient of x and 9



[1] Look at the phrases below and re-write them into an algebraic expression:

(1) A number minus 18 (..............................)

(2) The sum of seven and x (..............................)

(3) Two times eight (..............................)

(4) Six increased by twelve (..............................)

(5) Eight divided by twice a number (..............................)

(6) The product of a number and thirteen. (..............................)

(7) The quotient of x and four is thirteen (..............................)

(8) The quotient of x minus four is Nine (..............................)

(9) x times eleven is equal to thirty-three (..............................)



Notes:

An algebraic expression can have more than one operation.
Parentheses are used to express the result of addition or subtraction.

For Example:

The following algebraic expressions have two operations:

2 x + 5 Sum of the double of x and 5 7x -3 The difference between 7 times x and 3	2(x + 5) Double of the sum of x and 5 7(x -3) 7 times the difference between

Notice the change in the verbal expression when using the parentheses.

[2] Express each of the following verbal from using algebraic expressions.

(1) Adding x to 32 (..............................)

(2) p increased by 9 (..............................)

(3) m less than twelve (..............................)

(4) Sixteen less than m (..............................)

(5) 8 divided by n (..............................)

(6) The product of 6 and c (..............................)

(7) f minus m (..............................)

(8) Two more than m (..............................)

(9) Three-fourths of k (..............................)

(10) The sum of 5 and k (..............................)

(11) The quotient of b and 3 (..............................)

(12) The triple of m (..............................)

(13) m increased by p (..............................)

(14) 12 more than d (..............................)

(15) Double of x minus 3 (..............................)

(16) Exceeds m by 15 (..............................)

(17) 8 reduced by s (..............................)

(18) h divided by 3 then add 1 (..............................)

(19) x minus 5 plus m (..............................)

[3] Write each of the following algebraic expression in the verbal form:

(1) $9 + b$ ....

(2) $K - 2.5$ ....

(3) $X \div 7$ ....

(4) $9\ m$ ....

(5) $6x + 6$ ....

(6) $7 - 2x$ ....

(7) $9e + 1$ ....

(8) $2(t + 7)$ ....

(9) $\frac{h}{3} + 1$ ....

(10) $2m - 5$ ....

(11) $\frac{1}{3}x + 6$ ....

(12) $\frac{1}{3}(x + 6)$ ....



Concept (2)

Lesson (4) — Ordering of Operations and Exponents

You know how to factorize a number by writing it as the repeated multiplication.

For Example:

$$16 = 2 \times 2 \times 2 \times 2$$

- A third form of writing the number 16 is 2^4
- 2 is called "the base" and 4 is called "the power" OR "Exponent."
- It is read as: 2 to the power 4" OR "2 to the fourth power

For Example:

- $7 \times 7 = 7^2$, it is read as "7 to the power 2" OR "7 to the second power".
- $6 \times 6 \times 6 = 6^3$, it is read as "6 to the power 3" OR "6 to the third power".



[1] Complete the following:

(a) $3 \times 3 \times 3 \times 3 \times 3 = 3^{\cdots\cdots}$

(b) $5 \times 5 \times 5 = 5^{\cdots\cdots}$

(c) $6 \times 6 = 6^{\cdots\cdots}$

(d) $m \times m \times m = m^{\cdots\cdots}$

(e) $1 \times 1 \times 1 = \ldots\ldots^{\cdots\cdots} = \ldots\ldots$

(f) $8 \times 8 \times 8 \times 8 \times 8 = \ldots\ldots^{\cdots\cdots}$

(g) $5^3 = \ldots \times \ldots \times \ldots$

(h) $4^5 = \ldots \times \ldots \times \ldots \times \ldots \times \ldots$



[2] Find the value of each of the following:

(a) $3^2 =$ ....

(b) $4^3 =$ ....

(c) $7^2 =$ ....

(d) $2^5 =$ ....

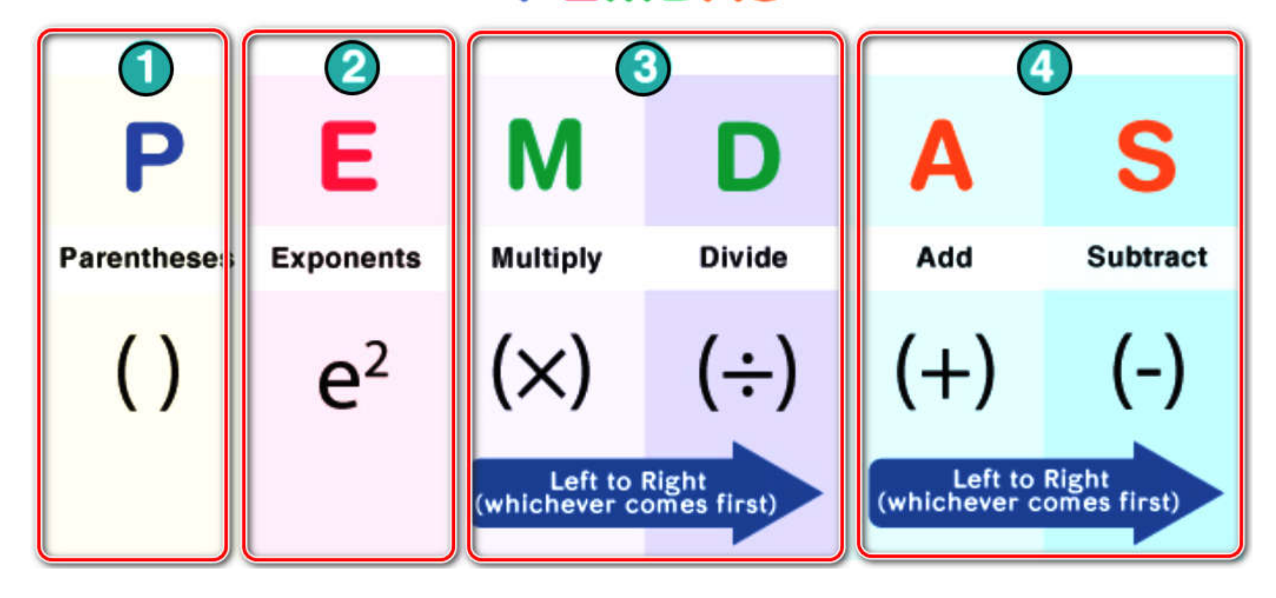
(e) $1^2 =$ ....

(b) $0^5 =$ ....

Order of Operations

Please Excuse My Dear Aunt Sally

PEMDAS





[3] Follow the order of operations to find the value of each of the following:

(1) 13 + 6 ÷ 2 = ...

(2) 2 × 6 – 4 ÷ 2 = ...

(3) (3 -1) + 4 ÷ 2 = ...

(4) 4× 2^3 – 20 = ...

(5) (2 + 1) × (9 – 6) + 18 = ...

(6) 20 + 5 + 8 – (4 – 1) = ...

(7) (7 – 4) × 2 + (5 – 3) = ...



[4] Calculate the value of each of the following:

(1) 2 – [(7 – 3) – 2]

= ....

= ....

= ....

(2) [7 – (5 – 2)] – 1

= ....

= ....

= ....

(3) [2 × (4 + 8) + 5] + 3

= ....

= ....

= ....

= ....

(4) 23 + [4 + (2 – 1)]

= ....

= ....

= ....

= ....

(5) [(2 + 23 – 7) × 2] + 4

= ....

= ....

= ....

= ....

(6) 10 × 3 + [4 – (9 – 8)]

= ....

= ....

= ....

= ....

[5] Choose the correct answer:

(1) 3^3 = ... { 6 , 9 , 3 , 12 }

(2) 6^0 = ... { 1 , 60 , 6 , 0 }

(3) $5^2 - 4^2$ = ... { 1 , 25 , 16 , 9 }

(4) $6^2 - 1^6$ = ... { 6 , 7 , 35 , 5 }

(5) $4^2 + 40 \div 5$ = ... { 20 , 12 , 24 , 12 }

Homework

[1] Re-write the following sentences into an algebraic expression:

(1) e divided by 5 (..............................)

(2) b decreased by 14 (..............................)

(3) The product of 4 and g (..............................)

(4) 10 times t divided by 3 (..............................)

(5) d increased by 2 (..............................)

(6) The difference between one-eighth and r (..............................)

(7) The difference between z and 20 (..............................)

(8) Twice j added to7 (..............................)

(9) 7 times p (..............................)

(10) 6 multiplied by m (..............................)



[2] Write each of the following algebraic expression in the verbal form:

(1) 10 – 5 ....

(2) X ÷ 9 ....

(3) 2 x + 4 ....

(4) P + 5 ....

(5) U – 9 ....

(6) 7 m ....

(7) 2 x = 27 ....

(8) n – 9 = 45 ....



[3] Complete the following:

(1) $6^2 =$ …… × ……. = …………

(2) $2^3 - 3 =$ …… – ……. = …………

(3) $8 \times 8 \times 8 =$ ……$^{\dots\dots}$

(4) $6 + 2 \times 4 =$ ………………………………

(5) $(10 - 4) + 6 \times 5 =$ ………………………..

(6) $4^2 + (9 + 7) \div 4 =$ ………………………



[4] Choose the correct answer from those given:

(1) $7^1 + 1^5 =$ ………………………………

(2) $9^0 + 9 =$ ………………………………

(3) $3^3 + 3^2 =$ ………………………………

(4) $3 + 4 \div 2 =$ ………………………………

(5) $(9 + 15) \div 6 =$ …………………………

(6) $6^2 - 5^2 =$ ………………………………



[5] Find the value of each of the following:

(1) $19 - (15 - 4) =$ ……………………………………………………

(2) $12 - (8 - 5) + 7 - 3 =$ ……………………………………………………

(3) $(19 - 7) \times (36 \div 3) =$ ……………………………………………………

(4) $(8+3^3) \times (9 - 4)^2 \div 5 =$ ……………………………………………………



Lesson (5) Evaluating Algebraic Expressions

[1] Evaluate each algebraic expression using the values given:

(1) $2x + 6$ [if $x = 3$]

=..........................

=..........................

=..........................

(2) $5m - 2$ [if $m = 4$]

= ....

=..........................

= ....



(3) $20 - 4x$ [if $x = 2$]

=..........................

=..........................

=..........................

(4) $3a + 9$ [if $a = 5$]

= ....

=..........................

= ....



(5) $3b - 4 \div 2$ [if $b = 4$]

=..........................

=..........................

=..........................

(6) $(2m + 5) \div 3$ [if $m = 5$]

= ....

=..........................

= ....



(7) $k^2 + 1 \div 2$ [if $k = 7$]

=..........................

=..........................

=..........................

(8) $20 \div (m^2 + 1)$ [if $m = 3$]

= ....

=..........................

= ....



[2] Chose the correct answer:

(1) If: $x + 3 = 5$, then $4x =$

ⓐ 4 ⓑ 4 ⓒ 8 ⓓ 32

(2) The value of the expression $4n - 5$ if $n = 2$ is.........

ⓐ 1 ⓑ 3 ⓒ 37 ⓓ 12

(3) The value of the expression $2a + 6$ if a 5 is ....

ⓐ 9 ⓑ 6 ⓒ 16 ⓓ 4

(4) If $x = 1$ then $1^5 =$......

ⓐ 6 ⓑ 1 ⓒ 5 ⓓ 4

(5) If $5x = 10$, then The value of x is ....

ⓐ 5 ⓑ 4 ⓒ 3 ⓓ 2



[3] Complete the following:

(1) In the rule: $y = x + 4$, if $x = 1$, then y would be ....

(2) If: $m - 2 = 7$, then $m + 1 =$ ....

(3) If: $8m = 0$, then, $100m =$ ....

(4) If: $m = 8$, then $6 + m =$ ....

(5) If: $x = 2$, Then $3x - 5 =$ ....



[4] Examine these two expressions: $3(x + 1)$ and $2x + x + 3$

(a) Try to find a value of x that will make these expressions equal.

(b) Decide if these two expressions are always equal and if they should be considered equivalent expressions.

....

....

....

Lesson (6) Applications on Algebraic Expressions

Write an algebraic expression

Ex. If the price of a small bottle of water is 3 pounds, then the price of:

2 bottles: 3 X 2
3 bottles: 3 X 3
4 bottles: 3 X 4
5 bottles: 3 X 5

Constant (3) — Variable (2, 3, 4, 5)

Notes From the above, we notice that:

- The price of a bottle is constant, while the number of bottles changes.
- If we denote the number of bottles by "x", then the algebraic amount that represents the purchase price of "x" bottles is 3



[1] Write the algebraic expression that represents each of the following statements:

(1) If the price of one book is 20 pounds what is the price of X box?

....

(2) If a meal costs 55 pounds, what is the price of "m" meals of the same type?

....

(3) Ahmed bought "x" kilograms of orange and put them in a box the costs 5 pounds. If the price of 1 kilogramme of orange is 30 pounds what is the amount paid by Ahmed?

....

(4) A TV costs "x" pounds. A DVD player costs 45 pounds less than the TV. Write an expression for the total cost of the TV and DVD player.

....

(5) If the price of one pen is 8 pounds, what is the price of "X" pens?

....

(6) Salah saves "z" pounds per day. How much does he save in a week?

....

(7) Mona wants to know how many legs there are on a farm of h horses and c chickens.

....

(8) Sara has a part-time job paying 105 pounds per hour. Write an algebraic expression for her earnings after she has worked for x hours.

....



[2] Choose the correct answer:

(1) If the price of one T-shirt is 120 Egyptian pounds, then the price of m T-shirt is ....

a) 120 m b) 120 + m c) M – 120 d) 120 ÷ m

(2) If Hanan saves "d" pound daily for S days, then her father gives her 20 pounds, then the amount that Hanan has now is.............

a) 5d -20 b) 5d + 20 c) 20 -5d d) 5 (d + 20)

(3) The value of the expression 2a +6 if a 5 is ....

a) 9 b) 6 c) 16 d) 4

(4) If x= 1, then 1^5=......

a) 6 b) 1 c) 5 d) 4

(5) The value of expression 3x + 7 [if x = 4] is ....

a) 10 b) 15 c) 22 d) 19



[3] Mira has 25 L.E. in her money box, she will save 20 L.E. daily.

(a) What algebraic expression represent this situation?

....

(b) How much money in her money box after 3 days?

....

(c) How much money in her money box after 6 days?

....

Homework

[1] Complete:

(1) If the price of one book equals 7 L.E., then the price of 7 books = ...

(2) Sarah saved k L.E. daily, so the money she saved in a week = ...

(3) Mira has 25 L.E. in her money box, she will save 10 L.E. daily.

(a) What algebraic expression represents this situation?

....

(b) How much money in the money box after 3 days?

....

(c) How much money in the money box after 6 days?

....



Lesson (7) Determining Equivalent Algebraic Expressions

Definition

Equivalent algebraic expressions are expressions that even though. they look different, they yield the same result. Whatever the number we substitute for the variable.

For Example:

Substitution value for the variable	$2x+10$	$2(x+1)+8$	Result
for $x=3$	$2\times3+10$ $=6+10=16$	$2(3+1)+8$ $=2\times4+8$ $=8+8=16$	Same
for $x=5$	$2\times5+10$ $=10+10=20$	$2(5+1)+8$ $=2\times6+8$ $=12+8=20$	Same
for $x=1$	$2\times1+10$ $=2+10=12$	$2(1+1)+8$ $=2\times2+8$ $=4+8=12$	Same



1. Evaluate the following expressions using two positive integers of your choosing to complete the table.

The value of x	$x+2x$	$2(x+2)$	Equal ?
for x = ...	....	....	....
for x = ...	....	....	....



Complete.

The value for x	1st expression	2nd expression	have the same value or not
a. If $x = 2$	$3x - 5$	$3(x+1) - 6$	....
b. If $x = 5$	$10 + 2(x - 1)$	$2x + 8$	....
c. If $x = 3$	$14 + 2x$	$8 + 3(x + 2)$	....
d. If $x = 1$	$14 + 2x$	$8 + 3(x + 2)$	....



[2] Evaluate each of these algebraic expressions using two positive integers of your choice. If the algebraic expressions are equal, answer yes. If algebraic expressions are not equal, answer no.

(a)	5x + 5	5(x + 1)	Equal or not
If x = …… If x = …….	…………………… …………………….	…………………… …………………….	……………………



(b)	2x + 3x +1	5x + 1	Equal or not
If x = ... If x = ...	....	....	....

(c)	9x + 6	9 (x + 6)	Equal or not
If x = ... If x = ...	....	....	....

Homework

1. Evaluate the following expressions using two positive integers of your choosing to complete the table.

The value of x	x + 2 x	2 (x + 2)	Equal ?
for x = ______	______ ______ ______	______ ______ ______	______
for x = ______	______ ______ ______	______ ______ ______	______



2. **Are they equivalent ?** Examine these two expressions and determine whether they are equal. If so, consider whether they are always equal. Complete each task. "Use positive integer values for x" $3(x+2)$ $2x+x+6$

a. Try to find a value for x that will make these expressions equal.

____

____

____

b. Try to find a value for x that will make the expressions not equal.

____

c. Decide if these two expressions are always equal and if they should be considered equivalent expressions.

____





Unit (3) Assessment

[1] Choose the correct answer.

1 Number of terms of the expression $3x + 2y - 5$ is ______

A. 2 B. 3 C. 4 D. 5

2 Which of the following are like terms ?

A. 5 , 7 B. $2x , x^2$ C. $5a , 5b$ D. m^2 , n^2

3 Sameh has 50 L.E. He bought 3 pens each for k L.E. , then the remainder is ______

A. 30 B. $3 + 50k$ C. $50 - 3k$ D. $50 + 3k$

4 Volume of a cube of edge length 5 cm is ______ cm^3

A. 6×5 B. 25 C. 5^3 D. 5^2

5 Which of the following expression has the same value of $3x + 5$ at $x = 3$

A. $3(x + 1) + 5$ B. $4x + 1$ C. $5x + 3$ D. $x^2 + 5$

6 5 times a number less 7 is ______

A. $5b + 7$ B. $7 - 5b$ C. $b^2 - 7$ D. $5b - 7$

7 The first operation or exponent you perform in $3 \times 5 + 3(2^3 - 5) - 4 \div 2$

A. parantheses B. plus C. multiply D. exponent

8 $7 + 3($ ______ $+ 5) - 4$, complete to get a numeric expression.

A. b B. k^2 C. $12 \div 2$ D. $x + y$

9 a. $5 \times 5 \times 5 \times 5 =$ ______

A. 5×4 B. 5^4 C. 4^5 D. 20

10 If the product of x and 5 is 45 , then x equals ______

A. 45×5 B. $45 + 5$ C. $45 - 5$ D. $45 \div 5$

[2] Complete the following:

1	The verbal form of the expression $5 - k$ is ....
2	$9 \times 9 \times 9 \times 9 \times 9 \times 9 = 9^{—}$
3	In the algebraic expression : $5x - 3y^2 + 4$, the constant is ....
4	Five squared = ...
5	c. The two like algebraic terms $5 - 4x + 7^2$ are ....
6	$5 + (3^2 - 2) \times 7 =$ ....
7	Area of the square whose side length 7 cm in the exponential form is .... cm^2
8	Twice the sum of a number and three in algebraic form is ....



[3] Essay Questions: Answer the following:

1. If the ticket of entring a car park is 25 L.E. and 10 L.E. for each hour you spend.

First : Write an algebraic expression to represent the relation between the total cost and the number of hours.

....

....

Second : What is the cost of spending 5 hours in the park ?

....

....



2. Use the order of mathematical operations to simplify : $40 + 5(3^2 - 7) + 10$

....

....



4 Evaluate the expression : $5x^2 + 8 \div (6 - 4) \div 2$ at $x = 3$



4 Evaluate each pair of the algebraic expressions at the given value for the variable and determine where the two expressions are equivalent or not.

4x + 2 and 2 (x + 2) If x = 1 and x = 6

(c)	4x + 2	2 (x + 2)	Equal or not
If x = …… If x = …….	…………………… …………………….	…………………… …………………….	……………………



5 Write algebraic expression to find the area of the opposite figure

5 cm

x cm 10 cm







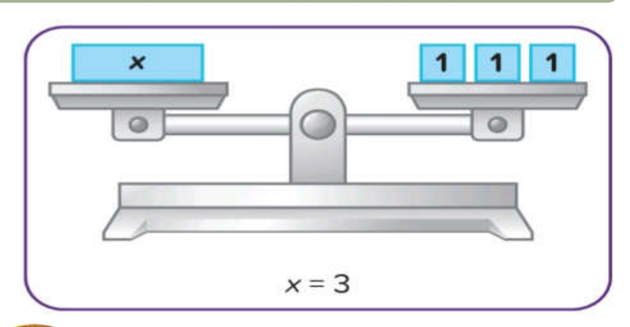
UNIT 4

Theme 1 | Number Sense and Operations: Expressions and Equations

Equations and Inequalities

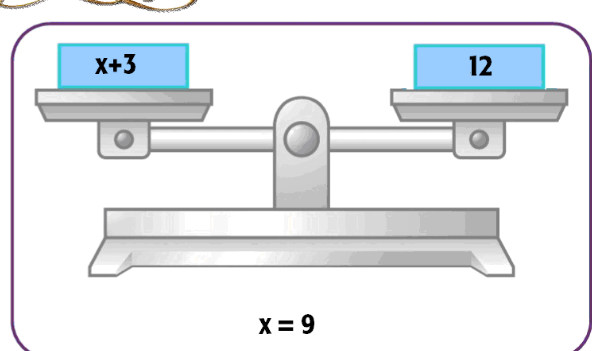
Concept (1)

Lesson (1) Solving Algebraic Equations



Equation: $X = 1+1+1$

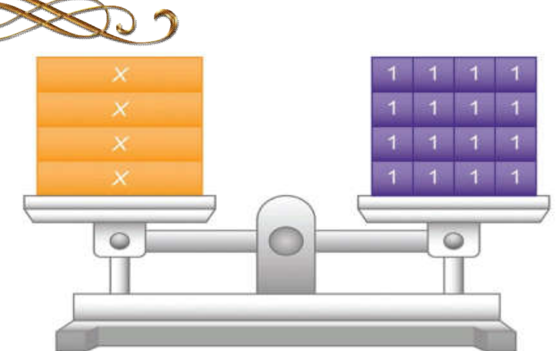
$X = 3$



Equation: $X + 3 = 12$

$X = 12 - 3$

$X = 9$



Equation: $4X = 16$

$X = 16 \div 4$

$X = 4$

Homework

[1] Choose the correct answer:

(1) $3x = 12$, Then $x =$ ....

ⓐ 1 ⓑ 2 ⓒ 3 ⓓ 4

(2) $y + 4 = 12$, Then $y + 2 =$ ......

ⓐ 4 ⓑ 5 ⓒ 8 ⓓ 10

(3) $m = 5$, Then $m = \frac{1}{2}$ ....

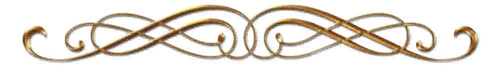
ⓐ 10 ⓑ 16 ⓒ 18 ⓓ 45

[2] Complete:

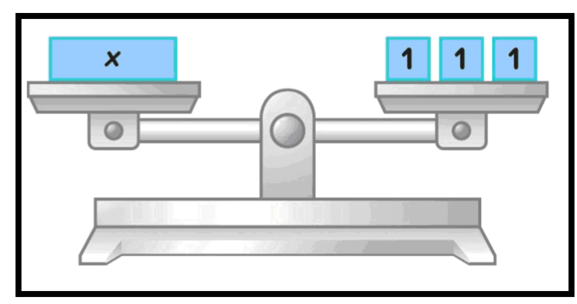
A) If: $x - 1 = 3$, Then $x =$ ....

B) If: $2x = 8$, Then $x =$ ....

C) If: $z + 5 = 11$, Then $z =$ ....

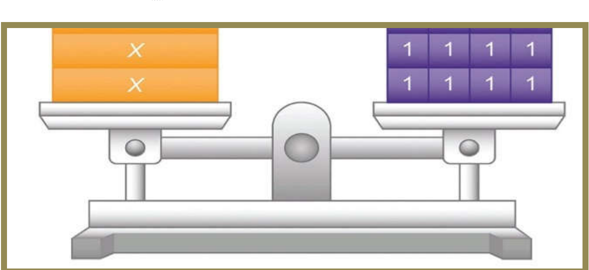


Find the value of x.





Find the value of x.





[4] Solve the following equations:

(A) $y + 5 = 14$	(B) $m - 7 = 10$	(C) $4x = 20$
....	....	....
....	....	....
....	....	....
....	....	....

[5] Write an equation for the following models, then solve it:

……………………………………………… ……………………………………………… ……………………………………………… ………………………………………………	……………………………………………… ……………………………………………… ……………………………………………… ………………………………………………
……………………………………………… ……………………………………………… ……………………………………………… ………………………………………………	……………………………………………… ……………………………………………… ……………………………………………… ………………………………………………



Lesson (2) Exploring Inequalities

Road Sign The sign shows the speed limit for a road in kilometers per hour. Record all speeds that are acceptable to drive on the road.

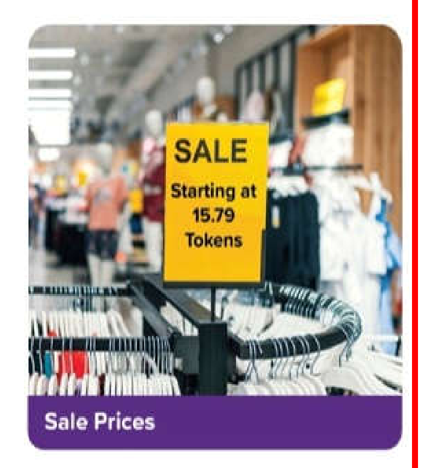


Speed Limit

A. 38 km/hr
B. 50 km/hr
C. 30 km/hr
D. 40 km/hr
E. 43 km/hr
F. 49 km/hr



Sale Sign The sign shows the sale prices of some clothing on a sale rack. Use the sign to determine any prices you might expect to pay for an item from this rack. Record all prices that apply.

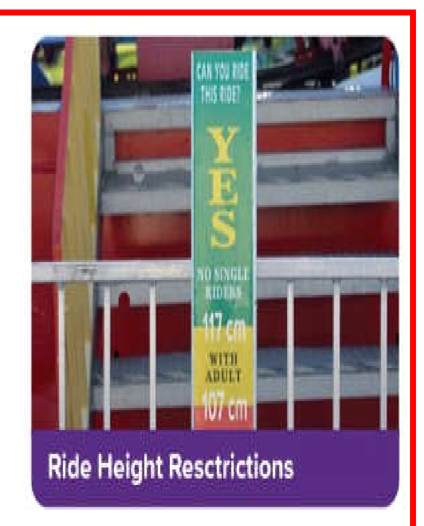


Sale Prices

A. 14.98 tokens
B. 18.97 tokens
C. 15.75 tokens
D. 29.83 tokens
E. 12.76 tokens
F. 15.79 tokens



Height Sign The sign shows the height limits for an amusement park ride.



Ride Height Resctrictions

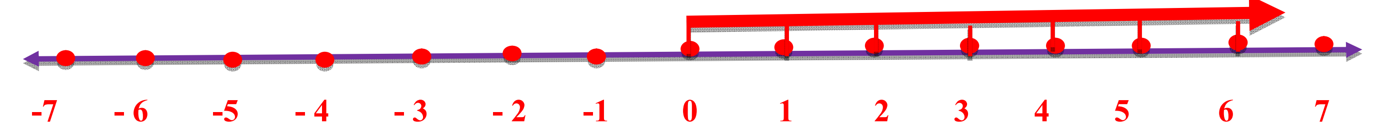
A. List three acceptable heights for a person to be able to ride the roller coaster.

B. List three unacceptable heights for a person to be able to ride the roller coaster.



Lesson (3) Solving Inequalities

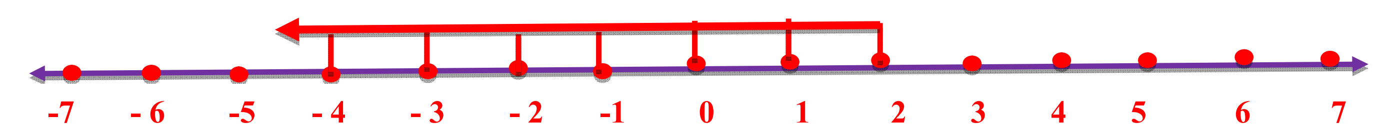
(A) The inequality: $X > -1$



The inequality $X > -1$ includes all the values to the right of -1 on the number line.



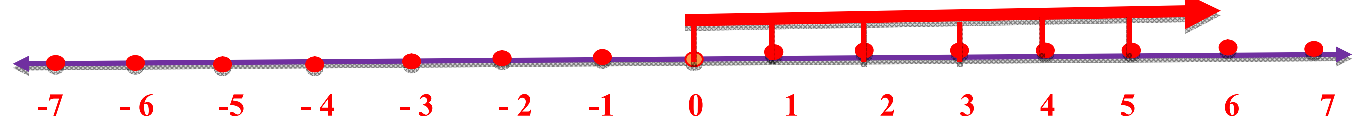
(B) The inequality: $X < 3$



The inequality $X < 3$ includes all the values to the left of 3 on the number line



(C) The inequality: $X \geq 0$



The inequality $X \geq 0$ includes the point zero and all the values to the right of zero on the number line



[1] Put true or False:

A) –2 belongs to the solution set of inequality $X > -2$ (   )

B) 4 belongs to the solution set of inequality $X > 4$ (   )

C) 3 belongs to the solution set of inequality $X > 0$ (   )



[2] Write the inequality that represents each of the following expressions:

A) All values greater than -1: ………………..

B) All values less than 3: ……………

C) All values to the right of -5 on the number line: …………



[3] Write an equation for the following models, then solve it:

……………………………………………… ……………………………………………… ……………………………………………… ………………………………………………	……………………………………………… ……………………………………………… ……………………………………………… ………………………………………………
……………………………………………… ……………………………………………… ……………………………………………… ………………………………………………	……………………………………………… ……………………………………………… ……………………………………………… ………………………………………………

Unit (4) Assessment

[1] Choose the correct answer:

(4) The inequality representing the statement "all values greater than -5" is …

ⓐ $X > -5$ ⓑ $X < -5$ ⓒ $X \geq 5$ ⓓ $X \leq 5$

(5) Which of the following values is a solution of the inequality $x < -2$?

ⓐ 0 ⓑ 1.5 ⓒ -3 ⓓ -2

(6) Number of solution set of inequality $X > 6$ is ……. ?

ⓐ 1 ⓑ 0 ⓒ -2 ⓓ Infinite



[2] Complete:

(A) All values greater than -1 are: ….. , ……. , ……. , ……. , ……

(B) All values smaller than 3 are: ….. , ……. , …….. , ……. , ……

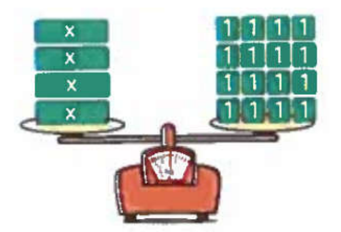
(C) $3Y = 21$, Then $Y =$ …….

(D) $N + 5 = 16$, Then $N - 1 =$ ….



[3] From the opposite figure:

Write an Equation and Solve Answer the following questions.



a. Write an equation for the opposite model.

____

b. Solve the equation. How do you know that you solved the equation correctly ?

____

____





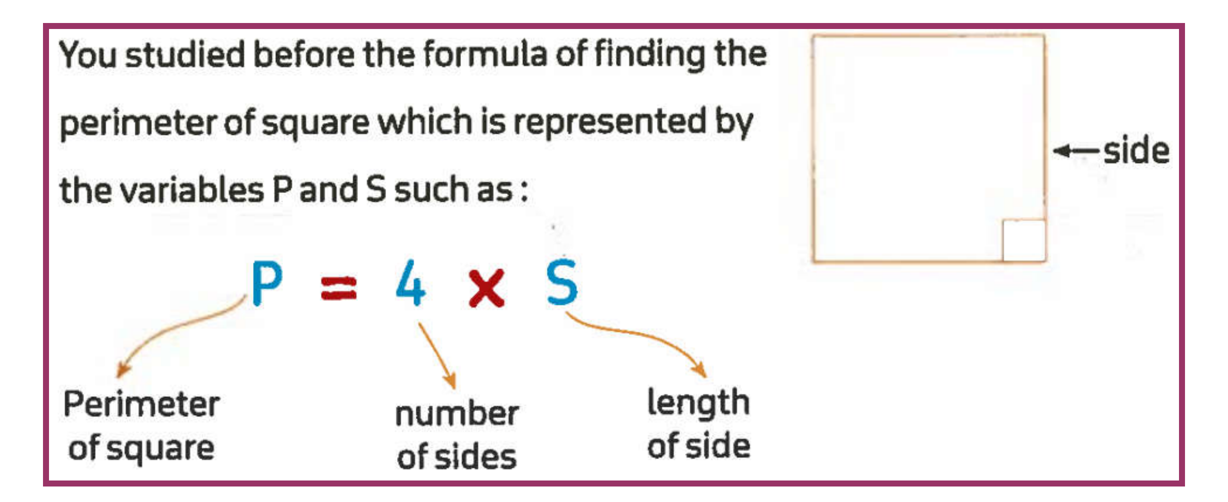
UNIT 5

Theme 2 | Mathematical Operations and Algebraic Thinking: Statistics and Data Analysis

Dependent and Independent Variables

Concept (1)

Lesson (1) — The Relationship Between Dependent and Independent Variables



The perimeter of square "P" depends on the length of its side "S", then "P" is called Dependent variable, "S" is called Independent variable and the mathematical relationship between variables "P" and "S" is dependency.

Dependency: in some relationships, one quantity depends on the other.



[1] Use the following equations and complete the table:

	The Equation	Dependent Variable	Independent Variable
a.	$x = 5y$	....	....
b.	$a = b - 12$	....	....
c.	$m = 5c - 7$	....	....
d.	$n = 8m + 12$	....	....



[2] Write each statement as an algebraic equation:

(1) 7 more than x equals y ....

(2) 33 more than s equals t ....

(3) g increased by 10 equals e ....

(4) x equals the sum of sixty three and z ....

(5) Five times c equals d ....

(6) k equals the product of 4 and h ....

(7) m equals twice n increased by 37 ....

(8) s equals the double of r added to 42 ....



[3] Write each equation as a verbal phrase:

(1) $x = 2y$ ....

(2) $z = y - 5$ ....

(3) $k + 20 = h$ ....

(4) $s - 3 = t$ ....

(5) $x + 14 = y$ ....

(6) $k + 2 = h$ ....

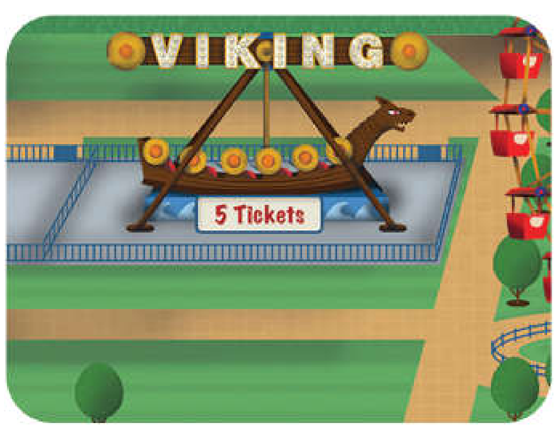


Lesson (2) Applications on Dependent and Independent Variables









If "t" is the total number of tickets, "r" is the number of times you want to ride the game, answer the following:

(1) If t = 6 r, what is the chosen game? ....

(2) If t = 8 r, what is the chosen game? ....

(3) If t = 3 r, what is the chosen game? ....

(4) If t = 6 r, what is the chosen game? ....

(5) If t = 4 r, what is the chosen game? ....

(6) If your brother wants to ride the Ferris wheel once and you are not sure what times you want to ride it. Write the equation that represents this situation.

....



Homework

[1] Use the following equations and complete the table:

	The Equation	Dependent Variable	Independent Variable
a.	$b = 2a$	…………	…………
b.	$n = 3 - m$	…………	…………
c.	$y = x - 5$	…………	…………
d.	$h = 3k + 10$	…………	…………
e.	$y = 18 - x$	…………	…………
f.	$d = 6 + 6c$	…………	…………
g.	$14 + 2e = f$	…………	…………
h.	$7y - 3 = x$	…………	…………



[2] Choose the correct answer:

(1) In the equation: $x = 3y - 7$, the dependent variable is ………
ⓐ x ⓑ 4 ⓒ y ⓓ 3

(2) In the equation: $9a - 31 = b$, the independent variable is ………
ⓐ 9 ⓑ a ⓒ 31 ⓓ b

(3) The equation that represents "8 more than s equals t" is ………
ⓐ $8s = t$ ⓑ $8t = s$ ⓒ $8 + s = t$ ⓓ $8 + t = s$

(4) The equation that represents "m equals the product of n and 3" is ………
ⓐ $m = 3n$ ⓑ $m = 3 + n$ ⓒ $n = 3m$ ⓓ $n = 3 + m$

(5) The equation that represents "4 times h added to 7 equals k" is ………
ⓐ $7h + 4 = k$ ⓑ $7k + 4 = h$ ⓒ $4h + 7 = k$ ⓓ $4k + 7 = h$

(6) The equation that represents "f equals the sum of adding 11 to the product of 8 and e" is ………
ⓐ $e = 8 + 11f$ ⓑ $e = 11 + 8f$ ⓒ $f = 8 + 11e$ ⓓ $f = 11 + 8e$

[3] Read and answer:

Popcorn Equation Think about a relationship between the food you want to buy and the amount of tokens you want to spend. Suppose you are buying 1 box of popcorn for a friend and you are not sure what to buy for yourself. Determine what is known and what will change.

Select two variables to write an equation for the total amount of tokens you will spend at the food stand and explain what each part of the equation represents.



....



[4] Write each statement as an algebraic equation:

(1) 9 more than y equals x ....

(2) 20 more than z equals h ....

(3) k increased by 9 equals f ....

(4) y equals the sum of eleven and x ....

(5) Three times k equals n ....

(6) h equals the product of 3 and d ....

(7) n equals thrice m increased by 12 ....



[5] Write each equation as a verbal phrase:

(1) $k = 20p$ ....

(2) $x = 4 + y$ ....

(3) $w + 12 = z$ ....

(4) $m - n = 3$ ....

(5) $x + y = 10$ ....

(6) $k - 2 = h$ ....

Lesson (3)

Analyzing the Relationship Between Dependent and Independent Variables

Use the equation $y = 3x$ to answer these questions.

A. Which variable represents the input number?

B. Which variable represents the output number?

C. Which is the dependent variable?

D. Which is the independent variable?



Write an Equation Use the variables x and y, where x is the independent variable. Write the equation for "multiply by 3 and add 4." Select the correct answer.

A. $x = y + 3x + 4$ **B.** $x = 3y + 4$ **C.** $y = 3x + 4$ **D.** $y = -3 + 4x$



Equation from a Table Use variables x and y to write the equation for each of the tables.

A.

x	0	4	8	12
y	4	8	12	16

B.

x	12	20	8	4
y	7	11	5	3



Evaluate each of the following for $x = 4$

a. $y = \frac{1}{2}x + 2$

b. $y = 3x + 1$



Lesson (4)

Graph Presentation for Dependent and Independent Variables

Write an equation.
Use the variables x and y, where x is the independent variable.
Write the equation "multiply by 3 and add 4" and substitute x by 0, 1
and 2 to evaluate y and record your results in a table, then represent the table on a graph.

....

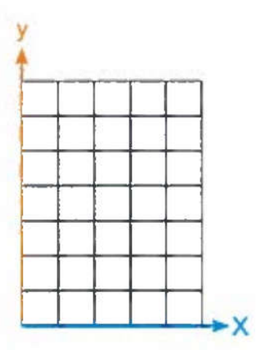
....



Complete the following tables then make the graph:

The equation : $y = x + 1$

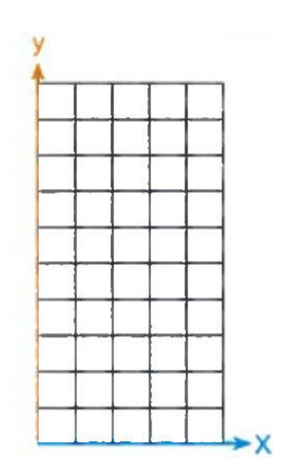
x	0	1	2
y	....	....	....
(x , y)	(0 , ...)	(1 , ...)	(2 , ...)





The equation : $y = 2x$

x	1	3	5
y	....	....	....
(x , y)	....	....	....





Homework

[1] Evaluate each of the following for x = 2:

(1) $y = 2x$ ....

(2) $y = x + 3$ ....

(3) $y = x - 1$ ....

(4) $y = x + 8.5$ ....

(5) $y = 4x - 5$ ....

(6) $y = 2x + 3$ ....

(7) $y = 5x + 30$ ....

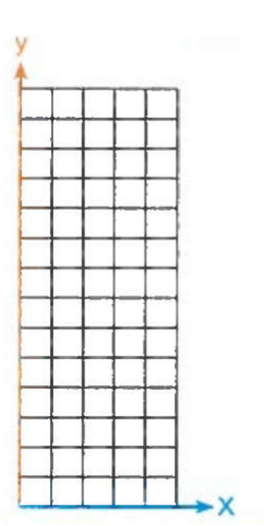
(8) $y = 7x + 2.3$ ....



[2] Complete the following tables then make the graph:

The equation : $y = 2 + 3x$

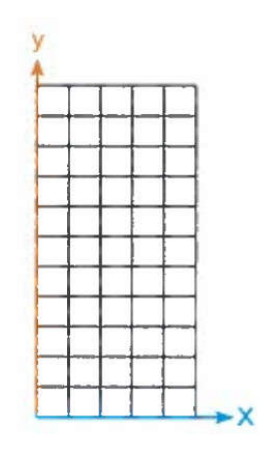
x	1	2	3	4
y	......	......	......	......
(x , y)	......	......	......	......





The equation : $y = 2x + 1$

x	0	2	3	5
y	......	......	......	......
(x , y)	......	......	......	......





Unit (5) Assessment

[1] Choose the correct answer:

(1) Which of the following is an equation?

a) $20x + 1.3$ b) $3 + a$ c) Twice x d) $f = k + 9$

(2) In the equation: $y = 1 + \frac{x}{2}$, if x = 8, then y = ...

a) 1.5 b) 4 c) 4.5 d) 5

(3) The independent variable in the equation $a = 3b + 1$ is ....

a) a b) 3 c) b d) 1

(4) k equals the product of h and 8 in equation is ....

a) $k = 8h$ b) $k = 8 + h$ c) $h = 8k$ d) $h = 8 + k$

(5) If (2 , a) satisfies the equation $y = 3x + 1$, then a = ...

a) 5 b) 6 c) 7 d) 8

(6) The dependent variable in the equation $s = 7t - 15$ is ....

a) s b) t c) 7 d) 15

(7) r equals nine times p added to 17 in equation is ....

a) $17 = 9p + r$ b) $9p = r + 17$ c) $9r = p + 17$ d) $r = 9p + 17$

[2] Complete:

(1) In the equation: $t = 7r$ and $r = 2$, then t = ...

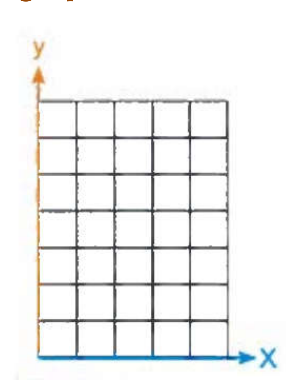
(2) "e equals f increased by 2.5" in algebraic equation is ....

(3) (4 , ...) satisfies the rule $y = \frac{1}{2}x + 4$.

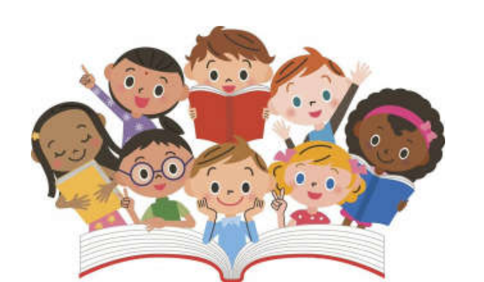
[3] Complete the table which satisfies the following equation, then graph:

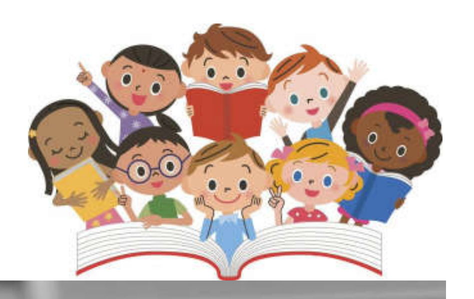
$y = 3x + 1$ and represent it

x	0	1	2
y			
(x , y)			









UNIT 6

Theme 2 | Mathematical Operations and Algebraic Thinking: Statistics and Data Analysis

Data Distributions

Concept (1)

Lesson (1) Data and Statistical Questions

Statistical questions	Non statistical questions
It's a question has possible different answers. **Ex:** How old are the students in your class?	It's a question has we get only one answer. **Ex:** How old are you?



[1] Select the type of each of the following questions:

		Statistical	Non statistical
a	How many emails do you have?		
b	How many emails do students have?		
c	What is the student's favorite story?		
d	Do you like apples?		
e	How many books have you?		
f	What is the name of your friends in school?		
g	Do you like color black?		
h	What is the student's favorite color?		
i	What is the name of your school?		
j	What time did the students in your class get up?		
k	What weight are you?		



Types of statistical questions

A numerical statistical question	A categorical statistical question
The result is numerical (quantitative) data	The result is descriptive data

[2] Select the type of each of the following questions:

		Numerical	Categorical
a	How many emails do you have?		
b	How many emails do students have?		
c	What is the student's favorite story?		
d	Do you like apples?		
e	How many books have you?		
f	What is the name of your friends in school?		
g	What is the favorite color of students in your class?		
h	How many pets do the students in your class have?		
i	What types of movies do students in your class like best?		

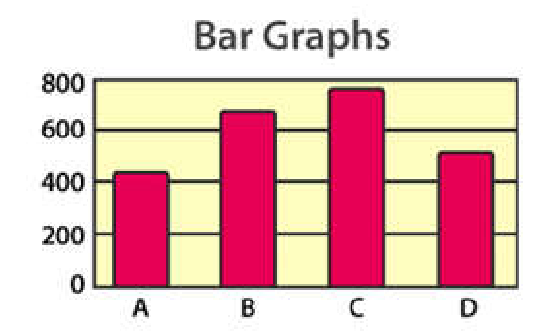


Lesson (2) — **Exploring the Histogram**

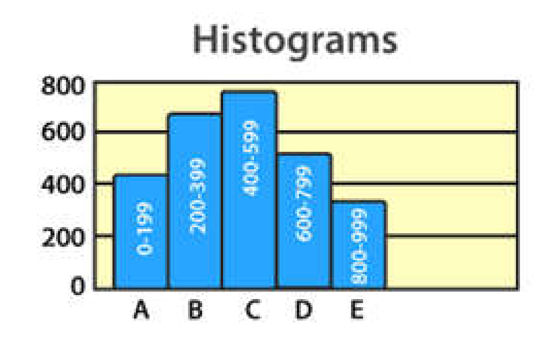
Lesson (3) — **Representing Data Using Histograms**

TYPES OF GRAPHICAL REPRESENTATION

Bar Graphs



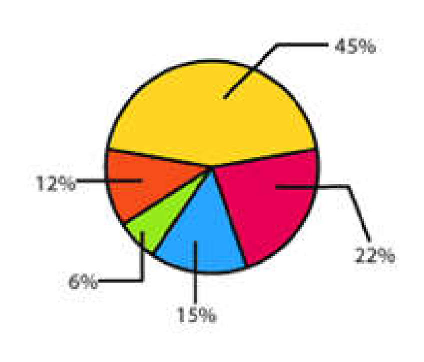
Histograms



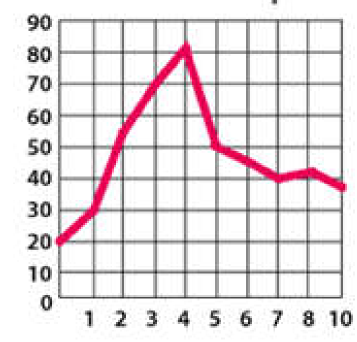
Frequency Table

Rulers of France		
Reign (Years)	Tally	Frequency
1-15	卌 卌 卌 III	18
16-30	卌 卌 I	11
31-45	卌 I	6
46-60	IIII	4
61-75	I	1

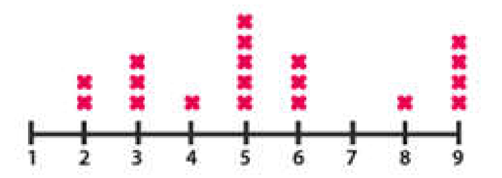
Circle Graph



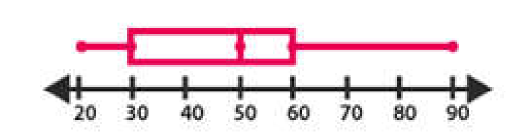
Line Graphs



Line Plot

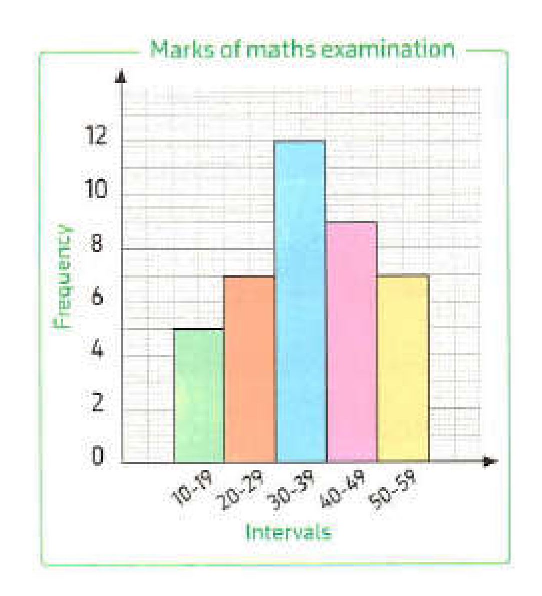


Box and Whisker Plot



Characteristics of histogram

1) Title.
2) Two axes:
   - Horizontal axis to represent data grouped in intervals.
   - Vertical axis has a scale.
3) Labels for each axis
4) Shows numerical data.
5) Bars represent data.
6) No gaps between bars.





• Difference characteristics between bar graph and histogram :

Bar graph	Histogram
Shows categorical data	Shows numerical data
The horizontal axis have data which can be anything	The horizontal axis included numerical interval (classes)
Bars have equal space between them	No gaps between bars
Bars can be rearranged	Bars cannot be rearranged



From the opposite histogram answer the following questions :

a. How many people are surveyed ?

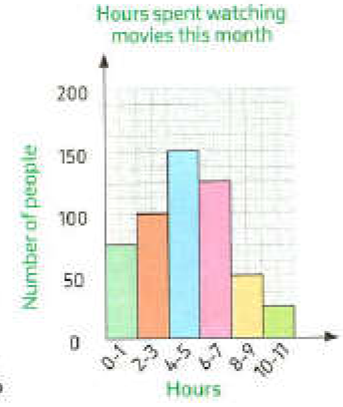
b. What is the frequency in the hours interval [6 - 7] ?

c. How many people in the hours interval [2 - 5] ?

d. Which hours interval has the maximum number of people ?

e. How many people spent watching movies 8 hours or more ?

f. How many people spent watching movies less than 4 hours ?



The following data represents the weights of 24 children in kilograms.

12	30	27	15	27	21	16	33
14	22	15	21	13	23	26	24
22	28	34	15	14	16	21	27

a. Form the frequency table.

b. Represent the data using histogram.

Sol

Range = Max value – Min value = 34 – 12 = 22

Choose 1st interval (12 – 16) and count weights of children from 12 to 16 (12, 15 , 16 , 14 , 15 , 13 , 15 , 14 , 16)

Intervals	Frequency
12 - 16	9
17 – 21	7
22 - 26	4
27 - 31	5
32- 36	2



Lesson (4) Exploring Box Plot

Median is the middle value of set of values after arranging it.

To find median after arranging if the number of values are

Odd

The median lying in middle exactly.

If the values are

31 , 24 , 64 , 19 , 57

After arrange :

19 , 24 , (31), 57 , 64

Then median is 31

Even

the median = $\frac{\text{sum of two middle values}}{2}$

If the values are

32 , 24 , 64 , 19

After arrange :

19 , 24 , 32 , 64

Then median = $\frac{24 + 32}{2}$ = 28

Lower quartile (Q1)

It is the middle value of the lower half of the set values.

Upper quartile (Q2)

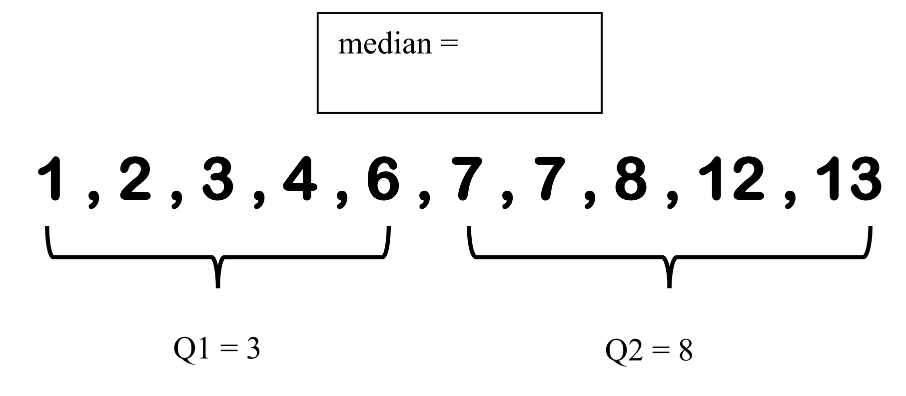
It is the middle value of the upper half of the set values.



Example:

Arrange the values ascendingly, then find median of values, Q1 and Q2

13 , 8 , 7 , 4 , 8 , 12 , 7 , 6 , 1 , 3 , 2





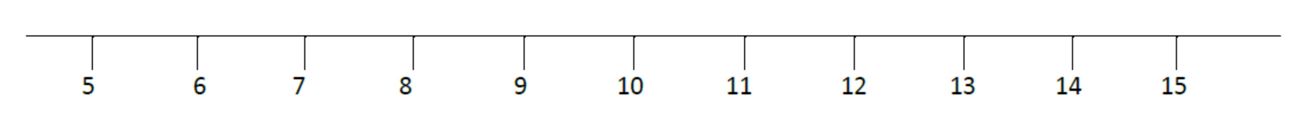
This data shows the number of books read by a group of students.



- Fill in the information and use it to draw a box plot on the number line below to show these results.

Books read	13	12	9	11	10	12	8	15	9	10	7	5

Minimum value	1st quartile	Median	3rd quartile	Maximum value	Range



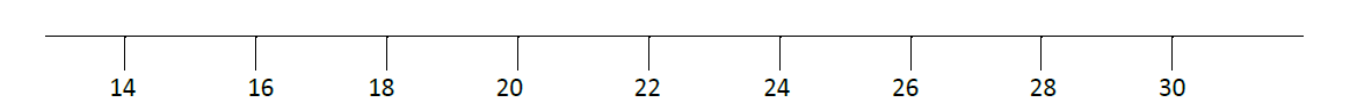


This data shows the number of points scored per game by a group of basketball players.

- Fill in the information and use it to draw a box plot on the number line below to show this data.

Points scored	23	18	20	27	22	15	29	21	22

Minimum value	1st quartile	Median	3rd quartile	Maximum value	Range





This data shows the temperatures from different states on the same day.

- Fill in the information and use it to draw a box plot on the number line below to show these results.

Temperature	55°F	52°F	41°F	45°F	75°F	57°F	42°F	48°F	63°F	39°F

Minimum value	1st quartile	Median	3rd quartile	Maximum value	Range



This data shows the height, in inches, of players on a soccer team.

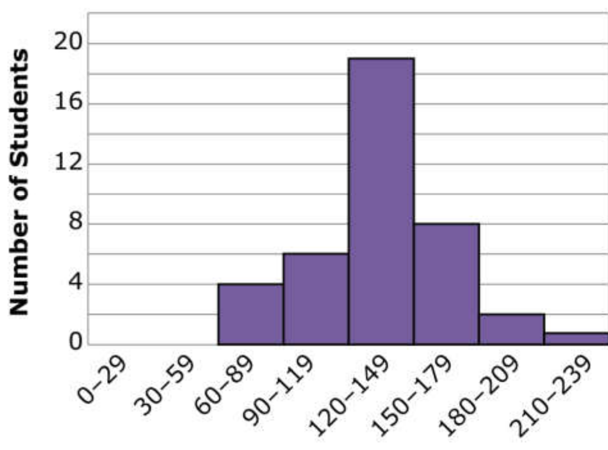


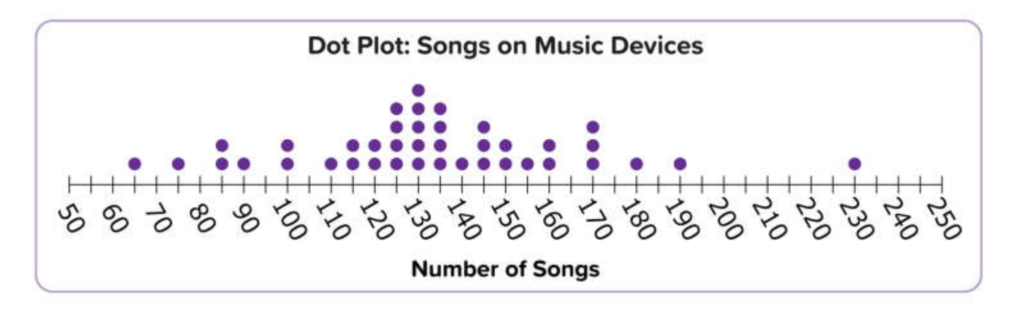
- Fill in the information and use it to draw a box plot on the number line below to show this data.

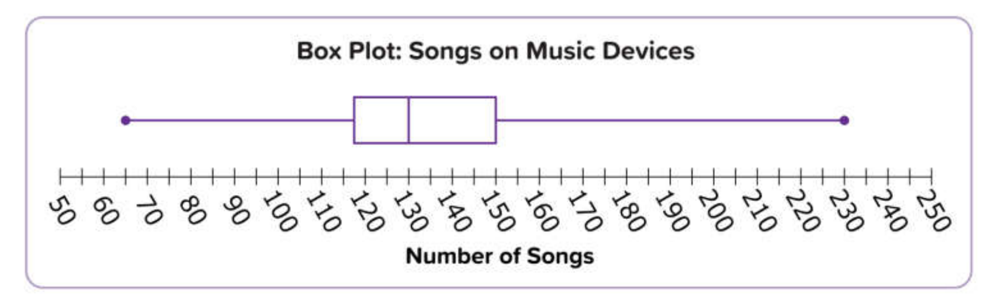
Player height (in)	65	69	76	78	73	69	71	70	67	71	80

Minimum value	1st quartile	Median	3rd quartile	Maximum value	Range

Lesson (5) Applications on Data Representations







Histogram Which of the following questions could be answered using the histogram? Identify all that apply.

A. What is the most common interval for the number of songs?

B. How many students are represented in the data?

C. How many students had 180 songs or more on their music devices?

D. How many students had exactly 120 songs on their music devices?

E. What was the greatest number of songs a student had?

F. How many students had from 90 to 179 songs?



Unit (6) Assessment

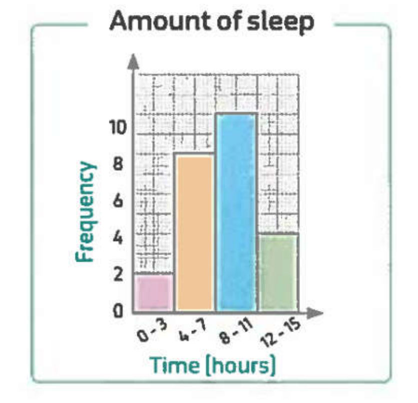
[1] Choose the correct answer:

1. Which display makes it easier to see the median ?
   A. histogram B. box plot C. dot plot D. bar graph

2. The median of the values 9 , 4 , 8 , 1 and 3 is ....
   A. 3 B. 4 C. 5 D. 8

3. From the opposite box plot the difference between the upper quartile and the lower quartile = ...
   A. 3 B. 29 C. 31 D. 32

4. The opposite histogram shows the number of hours that the students in your class slept last night. How many students slept at least 4 hours ....

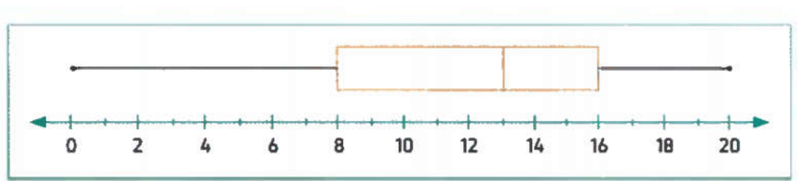




   A. 11
   B. 14
   C. 17
   D. 19

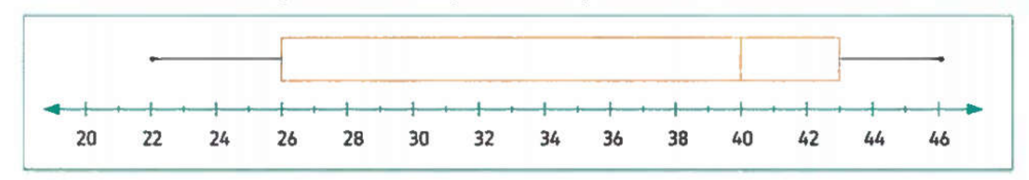
5. An interval frequency table with class intervals of equal sizes using 60-69 as one of the class interval in constructing the following data : 63 , 70 , 80 , 83 , 94 ,72 , 66 , 68 , 98 , 78 , 87 , 65 , 93 , 77 , 80 , 85 , 78 , 70 , 62 , 81 , 74 , 83 , 66 , 76 , 88 , then the frequency of the class 70 - 79 is ....
   A. 6 B. 7 C. 8 D. 9

6. From the opposite box plot the median = ...



   A. 8 B. 12
   C. 13 D. 16

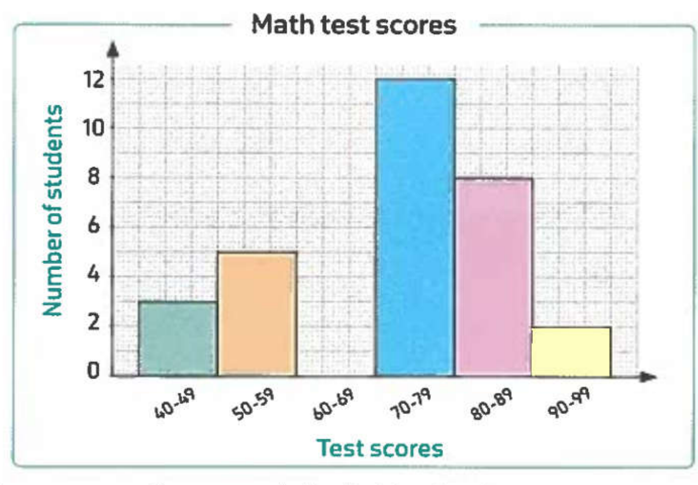
7. Which data could be represented by the box plot shown below ....



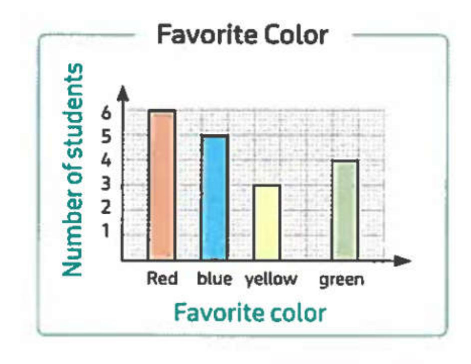
   A. 22 , 22 , 30 , 35 , 40 , 41 , 42 , 44 , 46
   B. 22 , 26 , 27 , 31 , 40 , 41 , 43 , 44 , 46
   C. 22 , 24 , 26 , 30 , 41 , 42 , 42 , 43 , 46
   D. 22 , 24 , 28 , 30 , 40 , 40 , 41 , 44 , 46

[2] Complete:

1. The median of the values 3 , 7 , 2 , 9 , 5 and 11 is ....
2. The types of statistical questions are .... and ....
3. The shape shows the set of data in form of intervals is ....
4. The upper quartile of the values : 5 , 6 , 11 , 10 , 1 and 3 is ....
5. The opposite histogram shows the distribution of scores of 30 students on a math test If the score of success is 50 or more, then the number of failed students is ....



6. We use .... graph to see exactly how many times each individual value occurs.
7. From the opposite bar graph : the number of students who did not prefer yellow color is ....



8. If the median of the values : k + 1 , k + 2 , k + 5 , k + 4 and k + 3 where k is a positive integer is 13 , then k = ...



[3] Answer the following question:

If you roll a die 17 times and the results are : 1 , 1 , 1 , 1 , 2 , 2 , 2 , 3 , 3 , 4 , 4 , 5 , 5 , 5 , 5 , 6 , 6 then dot plot , box plot and a histogram are used to display the same data. Write two questions that can only be answered using the dot plot but not the other two displays.





UNIT 7

Theme 2 | Mathematical Operations and Algebraic Thinking: Statistics and Data Analysis

Measures of Center and Variation

Concept (1)

Lesson (1) Exploring the Balance of Data Sets

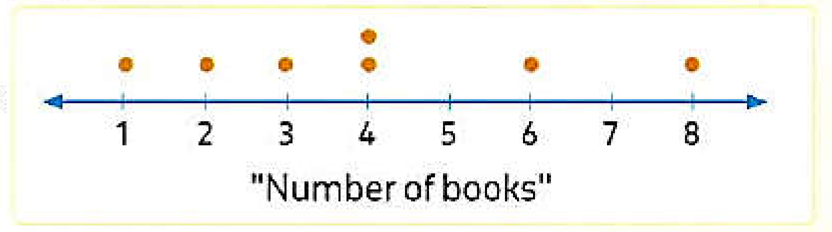
Balance point of the data set is a way to find the average of the data

For Example :

Ashraf asks 7 of his friends "How many books did they own ?". Ashraf reports his findings as a list or a display such as **a dot plot** where each dot represents one response.

▸ **List :** 1 , 2 , 3 , 4 , 4 , 6 and 8

• Dot plot :



Now : How can Ashraf find the balance point of this data ?

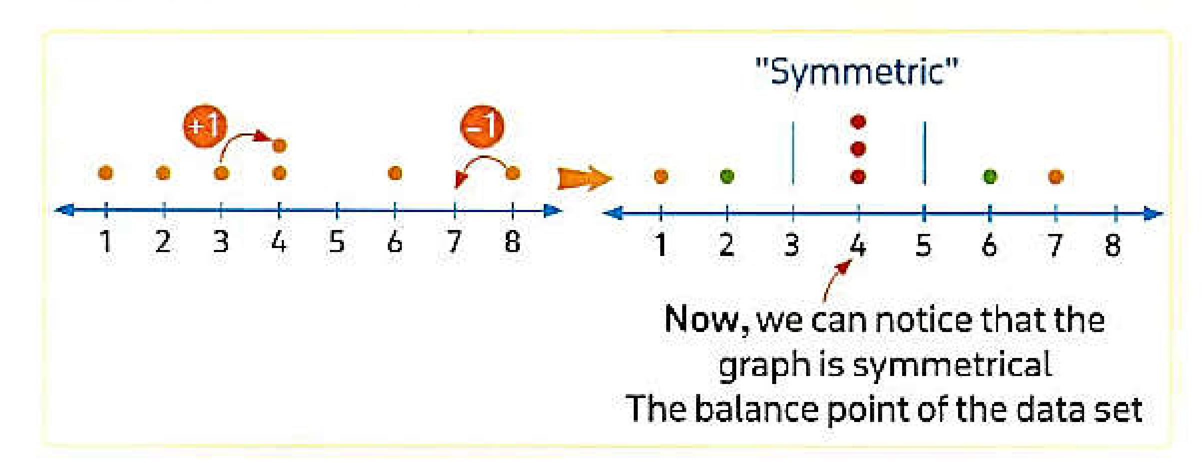
The sum of numbers in the list is : $1 + 2 + 3 + 4 + 4 + 6 + 8 = 28$

So, if we add one to any number of the list and subtract one from another number of the list, the sum is still 28

as : $\boxed{1 + 1} + 2 + 3 + 4 + 4 + 6 + \boxed{8 - 1} = 28$

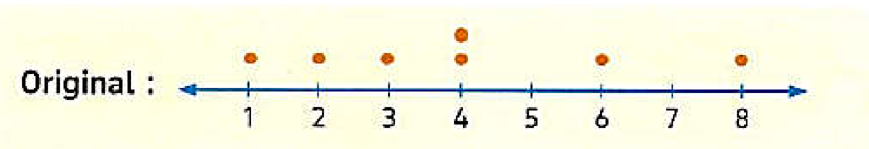
Note
You can add and subtract the same number

Finally, he can creat a new dot plot by moving the dots as a follow.



So, Ashraf find that "4" is the balance point of this data set.

Also Ashraf can find the balance point of this data by moving the dots.



Step 1

1 2 3 4 5 6 7 8

Step 2

1 2 3 4 5 6 7 8

Step 3

1 2 3 4 5 6 7 8

Step 4

1 2 3 4 5 6 7 8

Step 5

1 2 3 4 5 6 7 8

Step 6

1 2 3 4 5 6 7 8

Last step

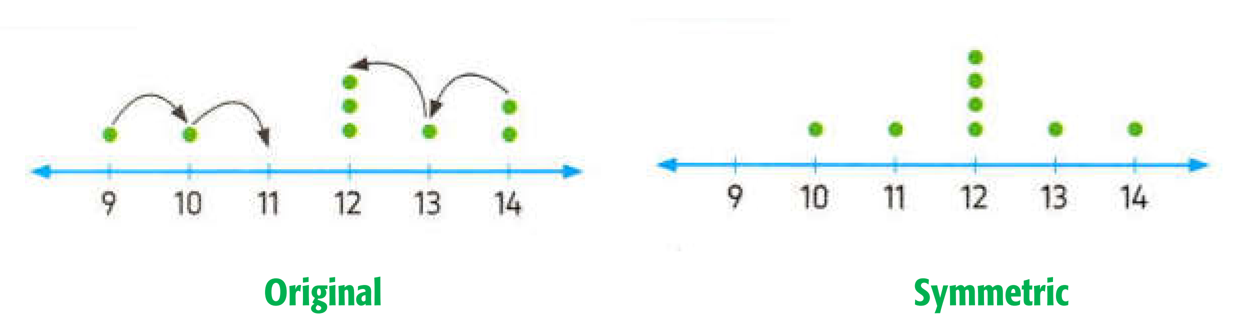
1 2 3 4 5 6 7 8

The balance point of the data set

So, Ashraf find that "4" is the balance point of this data set.

Ex: Find the balance point of the following data 13, 14, 14, 9, 10, 12, 12

First: **Second:**



The balance point of the data is 12



EX: Find the balance point of each of the following data :

(1) 2, 3, 5, 6, 7, 7

(2) 15, 8, 10, 5, 7

(3) 10, 11, 13, 13, 14, 15, 15

(4) 5, 2, 0, 1

(5) 9, 3, 6

(6) 0, 1, 2, 2, 3, 4, 4, 4, 5, 5

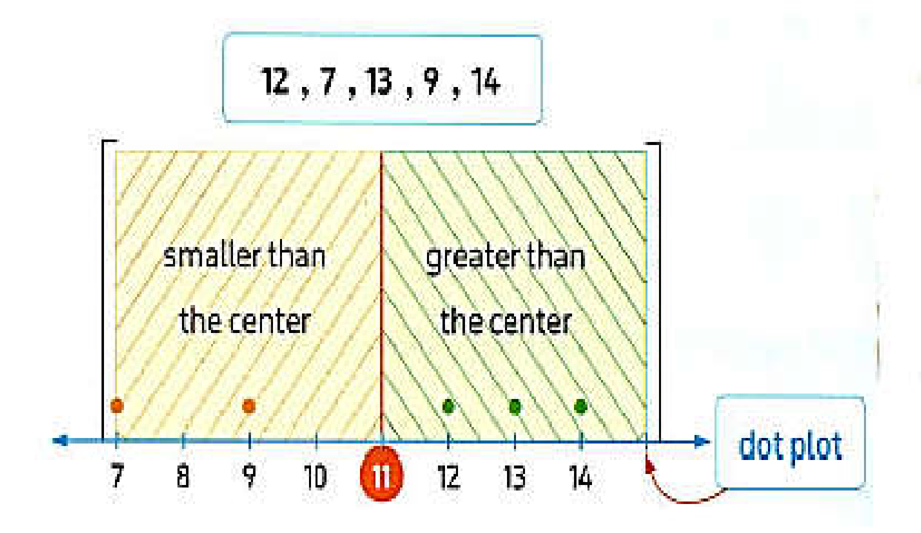


Lesson (2) Interpreting Arithmetic Mean

The mean is one measure of measuring central tendency

First: Mean as balance point

Here is the data set showing how long it takes for Hala to walk to school, In minutes, over 5 days. The center of this data set is 11



Try to complete the following:

a.

Time in minutes	Distance from 11	Smaller than 11 or greater than 11
12	1	greater than 11
7	4	smaller than 11
13	2	greater than 11
9	2	smaller than 11
14	3	greater than 11

b. Sum of distances which are smaller than 11 : $4 + 2 = 6$

c. Sum of distances which are greater than 11 : $1 + 2 + 3 = 6$

What do you Notice ? and Why ? Sum of distances which are smaller than 11 = sum of distances which are greater than 11

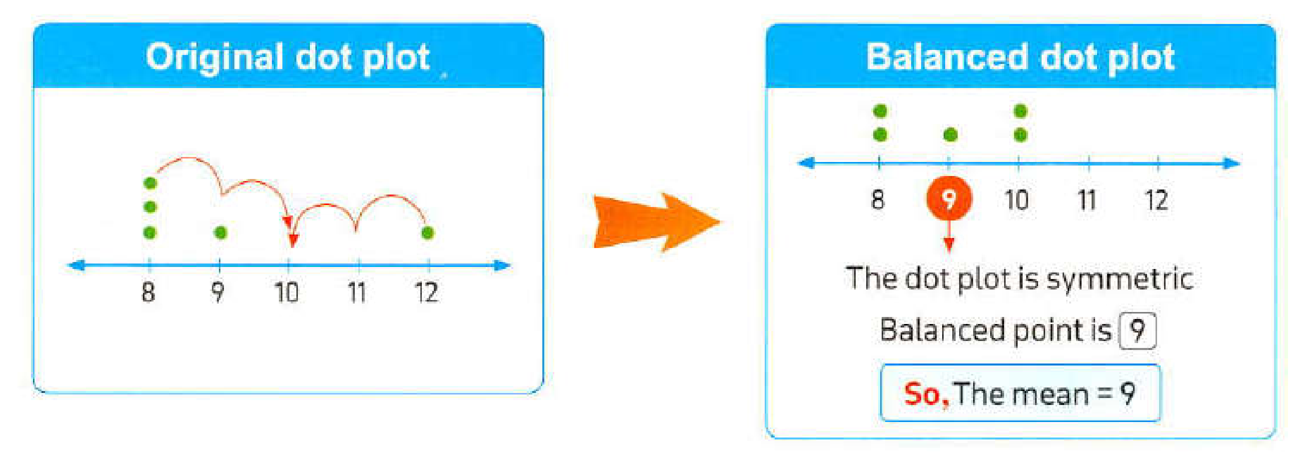


For Example :

Suppose Hany asks his friends how many toys they own. Hany report his findings as a list of a data display such as a dot plot where each dot represents one response.

▸ List : 8 , 8 , 8 , 9 , 12

Now : How can Hany calculate the mean of this data set ?





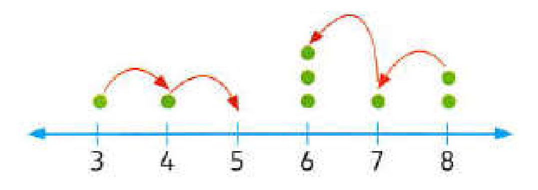
EX:

Calculate the mean of the following data using balanced point.

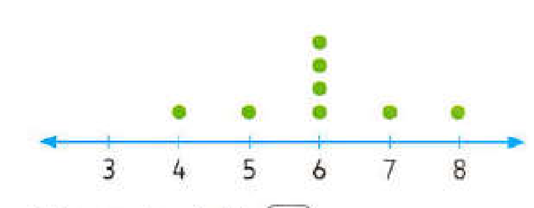
3 , 4 , 6 , 7 , 8 , 8 , 6 , 6

Solution

The original dot plot



The balanced dot plot



The Balanced point is 6

So, the mean = 6



EX: Calculate the mean of each of the following data (using balanced point)

(1) 3,4,4,9
(2) 9, 4, 3, 8, 6
(3) 2, 1, 3
(4) 11 ,12, 20, 12, 15
(5) 7, 7, 10, 9, 12
(6) 13, 14 ,16, 16, 17, 18, 18

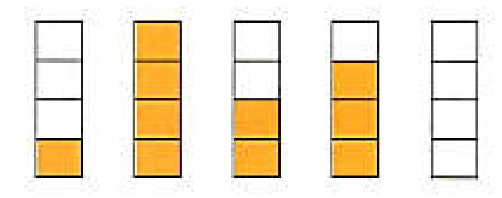


Second: Mean as fair share

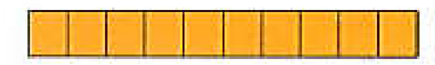
There are another way to find the mean as a fair share.

For Example :

Suppose there are 5 bottles which have the following amounts of water :
1 liter , 4 liters , 2 liters , 3 liters and 0 liters.

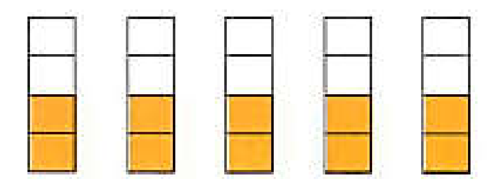


To find the mean, first we add up all of the values. We can think of as putting all of the water together: $1 + 4 + 2 + 3 + 0 = 10$



To find the "fair share" we divide the 10 liters equally into the 5 bottles : $10 \div 5 = 2$

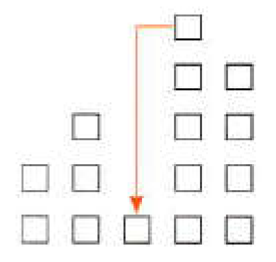
Then, the mean = 2 liters

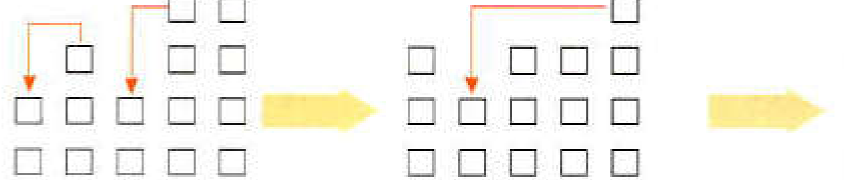


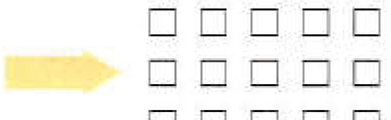


Find the mean of 2 , 3 , 1 , 5 and 4 (using the fair share).









So, the mean = 3



EX: Calculate the mean of each of the following data (using fair share)

(1) 7, 13, 6, 2

(2) 18, 6, 18

(3) 7, 8, 10, 11, 12, 12

(4) 0, 1, 3, 3, 3, 4, 5, 5

(5) 7, 8, 0, 5

(6) 1, 2, 3, 4, 5



Rule

The mean of a set of numbers :

Mean (Average) $= \dfrac{\text{Sum of the values}}{\text{The number of values}}$

EX:

Calculate the mean by using the rule for each of the following :

3 , 9 , 5 , 16 , 7

Solution

The rule: The mean $= \dfrac{\text{sum of the values}}{\text{the number of values}}$

The mean $= \dfrac{3+9+5+16+7}{5} = \dfrac{40}{5} = \boxed{8}$

[1] Calculate the mean of each of the following data by using the rule:

(1) 3, 4
(2) 6, 10
(3) 18, 6, 18
(4) 10, 2, 0, 20
(5) 1, $\frac{1}{2}$
(6) 19, 8, 3



The missing value in a set of data

The missing value = [The number of values X The mean] -[The sum of given values]

EX:

Find the value of x.

3 , 7 , x , 8 if the mean = 5

Solution 

Value of x = [The number of values × the mean] − [The sum of given values]

$x = [4 \times 5] - [3 + 7 + 8] = 20 - 18 = 2$

EX: Find the value of x in each of the following:

(1) 11, 20, x, 7 Mean = 14

(2) 8, 6, x, 5 Mean = 5

(3) 19, x, 4, 12, 4 Mean =11

(4) 4, x, 19 Mean =10

(5) 12, 21, x, 8 Mean =15

(6) 18, 17, 15, x, 16 Mean =16



Exercises

[1] Choose the correct answer:

(1) The mean of 3,4,5 is ……….
ⓐ 4 ⓑ 5 ⓒ 3 ⓓ 12

(2) The mean of the data set (The value) = ……….
ⓐ 4 ⓑ 22 ⓒ 5 ⓓ 5.5

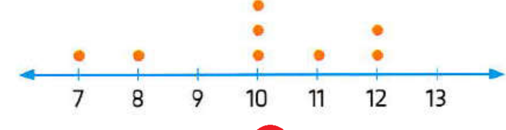
(3) The mean of the set of data 3,6,4,9 is ………
ⓐ 9 ⓑ 8 ⓒ 72 ⓓ 4

(4) If The sum of marks of 8 students is 48, then the mean for their marks = ……
ⓐ 8 ⓑ 6 ⓒ 12 ⓓ 48

(5) The mean of data set 8,10,12 is ....

a) 12 b) 8 c) 10 d) 30

(6) In The opposite dot plot , The mean is ....



a) 7 b) 8 c) 10 d) 11

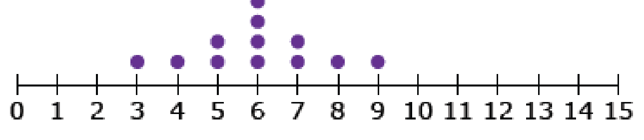
(7) The mean of the values 5,6,0,4 is ....

a) 20 b) 4 c) 5 d) 6

(8) If the sum of marks of 3 students in Maths test is 36 ,The mean of students marks is ....

a) 36 b) 3 c) 12 d) 39

(9) In the opposite line plot the balance point is ....



a) 42 b) 6 c) 3 d) 9

(10) Which set has the greatest mean

a) 1, 2, 4, 2, 1 b) 8, 7, 3 c) 10, 5, 15 d) 6, 9

(11) The mean of 16.5, 18.9, 16.5 and 14.6 is ....

a) 16.6 b) 16.7 c) 16.62 d) 16.625

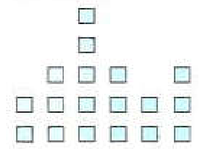
(12) The balance of the data set 21, 22, 24, 24, 25, 26 and 26 is ....

a) 26 b) 25 c) 24 d) 22

(13) If the mean of 8, 6, x and 5 is 5 , Then x = ...

a) 4 b) 3 c) 2 d) 1

(14) The mean of the following represented data is ....



a) 2 b) 3 c) 4 d) 5

(15) If the mean of the side length of a triangle is 8cm ,Then the perimeter of the triangle is ....

ⓐ 8 cm ⓑ 18 cm ⓒ 24 cm ⓓ 15 cm

(16) If the mean of the ages of Mariam and Joudy is 7 years and the age of Mariam is 8 years , Then the age of Joudy is .... years

ⓐ 6 ⓑ 7 ⓒ 8 ⓓ 15

(17) The mean of the marks of 5 students is 20 marks , Then the sum of there marks = ... marks

ⓐ 4 ⓑ 15 ⓒ 25 ⓓ 100



[2] Complete:

(1) The mean of the values 18,35,24 and 6 is ....

(2) The mean of the values 4,3,and 5 is ....

(3) The mean of the values 1,2,3,4 and 5 is ....

(4) The average of the values 35,50,60 and 55 is ....

(5) The average of the values 20,20,20 and 20 is ....

(7) If the mean of the numbers 3,5,x is 4, then x = ...

(8) If the sum of marks for 12 students in Maths test is 312 marks ,Then the mean of student's marks is ....



Essay questions

[1] The opposite table represents Omar's Marks in Maths test within 5 months.

Months	September	October	November	December	January
Marks	25	30	25	30	30

Find the mean of Omar marks.

[2] The opposite table represents number of Sirag's studying hours in 6 days. Calculate the mean of number of hours.

Day	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday
Number of hours	8	5	5	6	6	4



[3] The opposite table represents number of books that Joudy's reads in 6 days. Calculate the mean of number of books.

Day	1st day	2nd day	3rd day	4th day	5th day	6th day
Number of hours	2	3	4	1	2	2



[4] The set of data 11, 4, 3, 10 represent the number of goals that Yassin scored in handball matches. Calculate the mean of the number of goals.



[5] If the temperature degrees for a week in Decembre are 25°, 27°, 31°, 23°, 22° and 18° Calculate the mean of these degrees.



Homework

[1] Choose the correct answer:

(1) The balance point of the data set 5, 6, 8, 8, 8, 9, 10 and 10

ⓐ 5 ⓑ 7 ⓒ 8 ⓓ 10

(2) The mean of the opposite data = ...



ⓐ 4 ⓑ 5 ⓒ 6 ⓓ 7

(3) If the mean of the values 10, 13, 17, x, 10 is 11 then x equals ....

ⓐ 10 ⓑ 5 ⓒ 13 ⓓ 11

(4) The mean of the data set 5, 9, 3, 16 and 7 is ....

ⓐ 16 ⓑ 7 ⓒ 9 ⓓ 48

(5) The mean of data set 8, 10, 12 is ....

ⓐ 12 ⓑ 8 ⓒ 10 ⓓ 30



[2] Complete:

(1) The average of the values 15, 15, 15, 15 is ....

(2) The sum of six numbers is 36 , Then the mean of these numbers is ....

(3) The balance point of the following data set 11, 12, 14, 14, 15, 16, 16 is ....

(4) The mean of the values 13, 14, 10, 13 and 10 is ....

(5) If the mean of the values 2, x, 7 is 5 , Then x = is ....

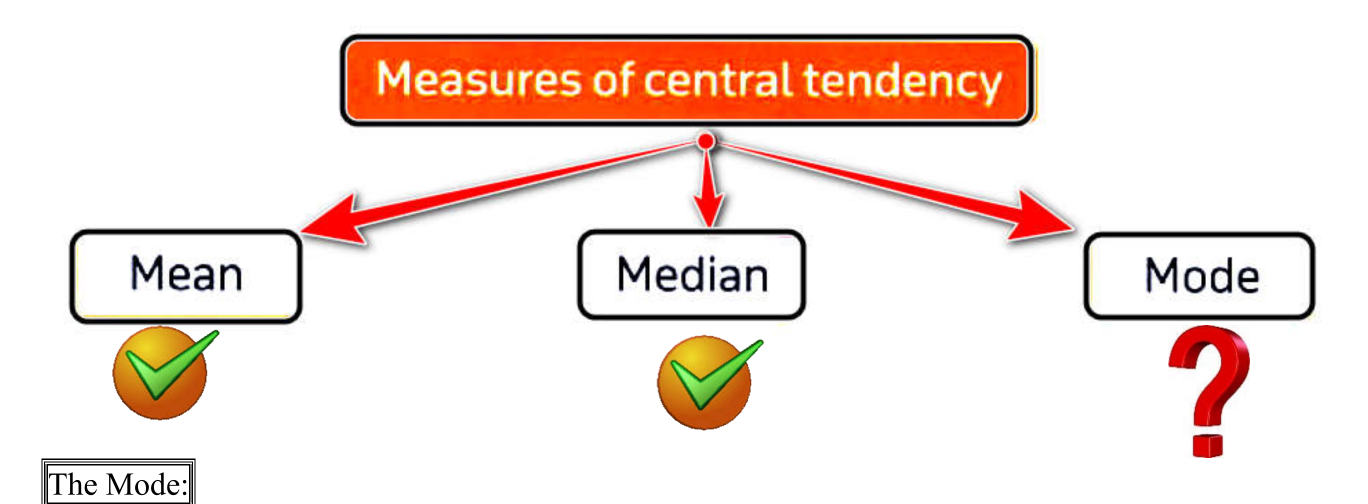


[3] If the number of goals registered by a football team in 6 matches are 3, 2, 0, 6, 1 and 6. Calculate the mean of the number of goals



[4] If the heights of 4 trees are 14 dm, 7dm, 9dm and 6 dm. Determine the mean of the trees heights

Lesson (3) Exploring Median, Mode and Outliers



The Mode:

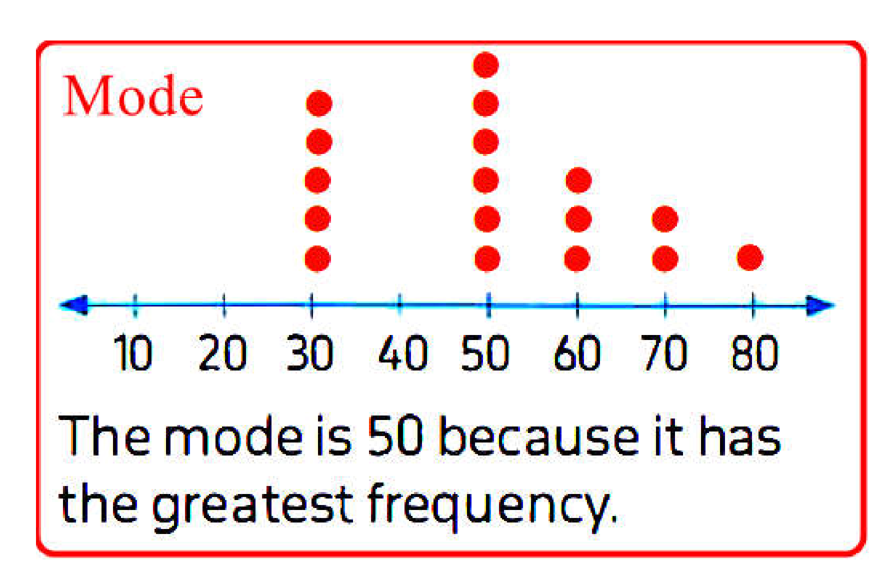
The mode of a set of data is the most common (frequent) value in the set.

Example (1): Mode in the values 5 ,3 ,**8** ,9 ,**8** ,12 is 8.

Example (2): Mode in the values **3** ,**7** ,2 ,1 ,**3** ,**7** , 8 is 3 and 7.

Example (3): there is no mode in the values 8, 3, 9, 5, 4, 2, 10, 0

Remark:



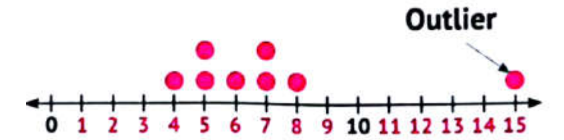
Check :

Find : mode for. The set of data 19 ,3 ,5 ,7 ,4 ,5 ,6

Outlier:

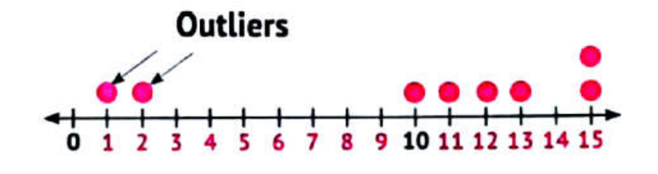
Outliers are values that **"lie outside"** (is much **smaller** or **larger** than) most of the other values in a set of data.

Example (1): Values: "7, 6, 5, 8, 7, 4, 15, 5" " 15 "is called an **outlier**.



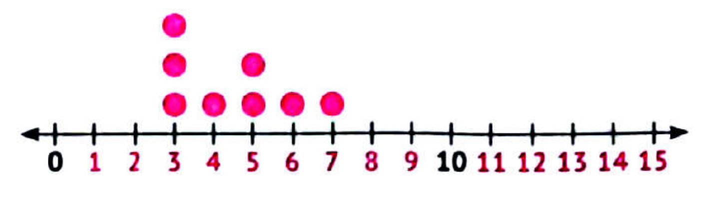


Example (2): Values: "12, 15, 2, 1, 10, 15, 13, 11" **1** and **2** called an **outlier**.





Example (2): Values: 6, 3, 7, 5, 3, 5, 4, 3". There are no outliers.
• Because all values are close to each other.





Chose the correct answer:

(1) The outlier value of the following data set is ________ (24 , 25 , 21 , 22 , 7 , 21 , 23)

ⓐ 25 ⓑ 24 ⓒ 21 ⓓ 7

(2) The mode of the following data set [3 , 4 , 5 , 3 , 5 , 7 , 5 , 9 , 5 , 2] is ________

ⓐ 3 ⓑ 5 ⓒ 7 ⓓ 9

(3) The mode of 7 , 9 , 7 , 8 , 7 , 6 , 7 and 10 is ________

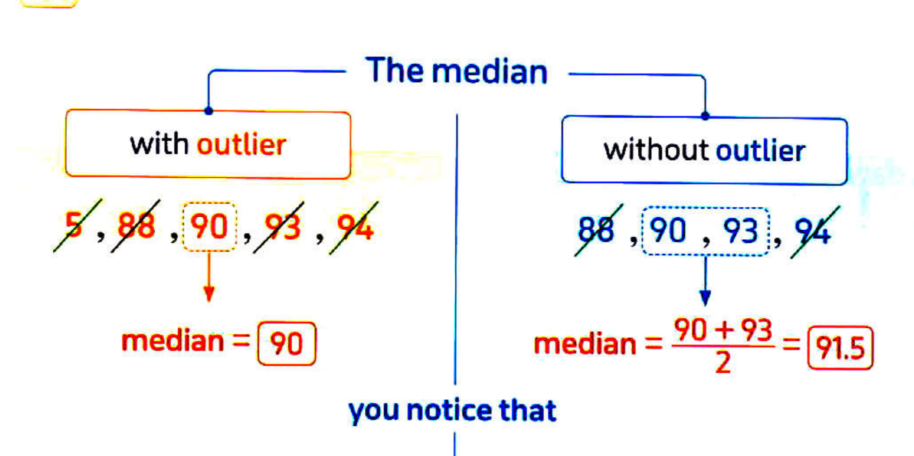
ⓐ 7 ⓑ 8 ⓒ 9 ⓓ 10



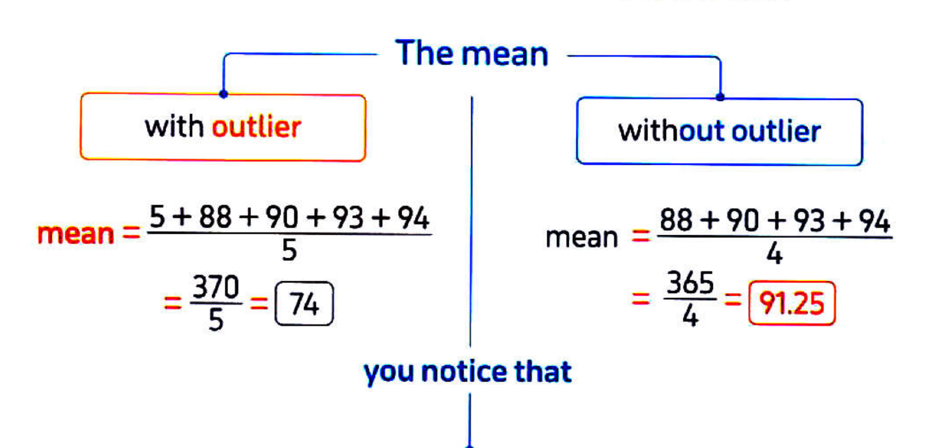
How the outlier affects the median and the mean of the following quiz scores?

5 88 90 93 94

- The outlier is 5



The outlier has week effect on the median



The outlier has great effect on the mean





The mean **is affected by** outliers in the data set.

The mean
- increases if the outliers are greater than the other values.
- decreases if the outliers are less than the other values.

The median **is not affected by** outliers in the data set.

Remarks

1. If the outlier values are smaller than the other values, then the outlier decreases the mean.
2. If the outlier values are greater than the other values, then the outlier increases the mean.
3. The more number of outliers, the more effect on the mean.



Which is better to use (Median or Mean) for dot plot graph ?

a. If the dot plots are distributed in one side of the graph



The median is better

b. If the dot plots are distributed symmetrically on the graph



Either mean or median

c. If the dot plots are distributed evenly on the two sides of the graph without symmetry



The mean is better

Don't forget : In case of outlier the median is better.



1. Find the mode of each of the following:

(a) 7 , 6 , 4 , 8 , 2 , 5 , 11 , 4

……………………………………………………………………….

(b) 6 , 2 , 5 , 6 , 4 , 1 , 6 , 2 , 9

……………………………………………………………………….

(c) 21 ,26 ,26 ,29 ,29 ,29 ,31

……………………………………………………………………….



2. Select the outlier in each of the following data set:

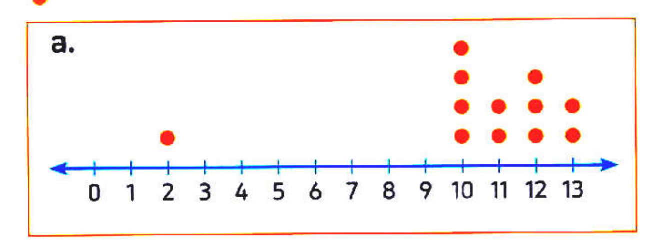
(a) 1 ,3 ,2 ,5 ,4 ,76 ,6 ,7 ,9 ,8

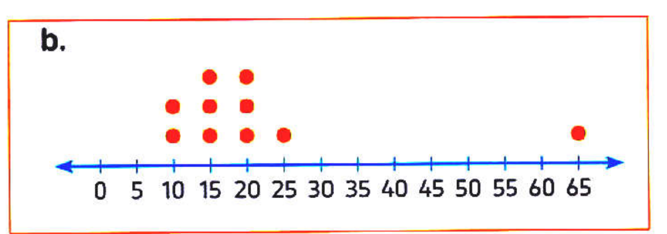
(b) 6 , 2 , 5 , 6 , 4 , 1 , 6 , 2 , 9

(c) 101,103 ,105, 102 ,107 , 106 ,2000 ,104

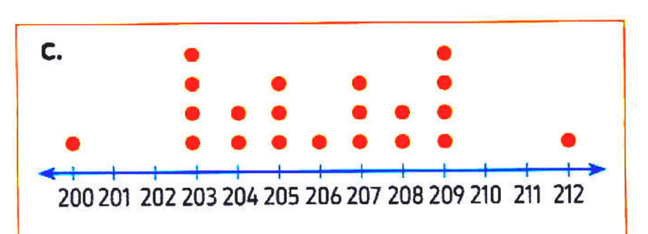


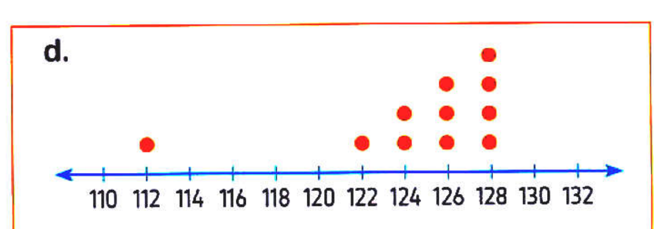
3. Match each dot plot graph with the related description about affecting the outliers on the mean.





Mean increases • Mean stays the same • Mean decreases





4. Complete.

A ______ are values that lie away the other values.

B The outlier value of the data set [7 , 46 , 48 , 49 , 50 , 51 , 52] is ______

C The two outlier values of this data set [31 , 205 , 207 , 200 , 201 , 206 , 202 , 209 , 1,000] are ______ and ______

D ______ is the measure of central tendency changed more with the outlier.

E The better measure of central tendency for data set with outlier value is ______

F ______ is the better measure of central tendency for data set with no outlier value.

G The ______ is the value that occurs most often.

H The mode of [7 , 10 , 15 , 7 , 10 , 13 , 7 , 15 , 7] is ______



Choose the correct answer:

(1) Mode is the ______ of the data.

ⓐ most occurs value ⓑ middle value ⓒ average value ⓓ none of these

(2) A set of values with two modes are called ______

ⓐ bimodal ⓑ trimodal. ⓒ multimodal. ⓓ non-modal.

(3) The mode of 5 , 3 , 10 , 4 , 11 , 3 is ______

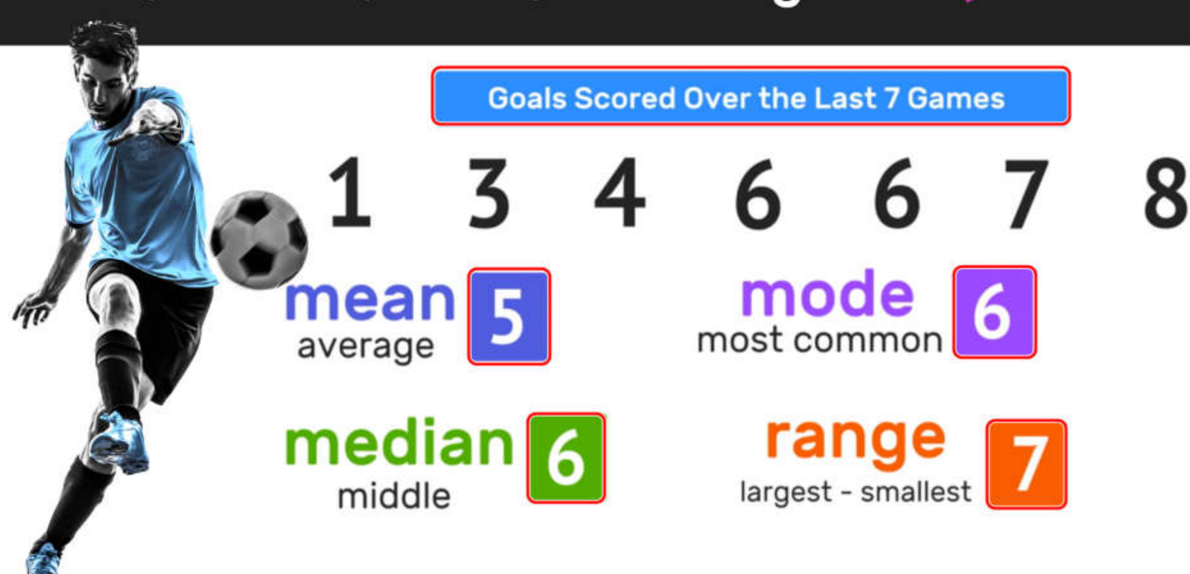
ⓐ 3 ⓑ 4 ⓒ 5 ⓓ 10

(4) The outlier value of the following data set is ______

75	73	74	71	7	72	70

ⓐ 7 ⓑ 70 ⓒ 71 ⓓ 75

Lesson (4) Exploring the Range

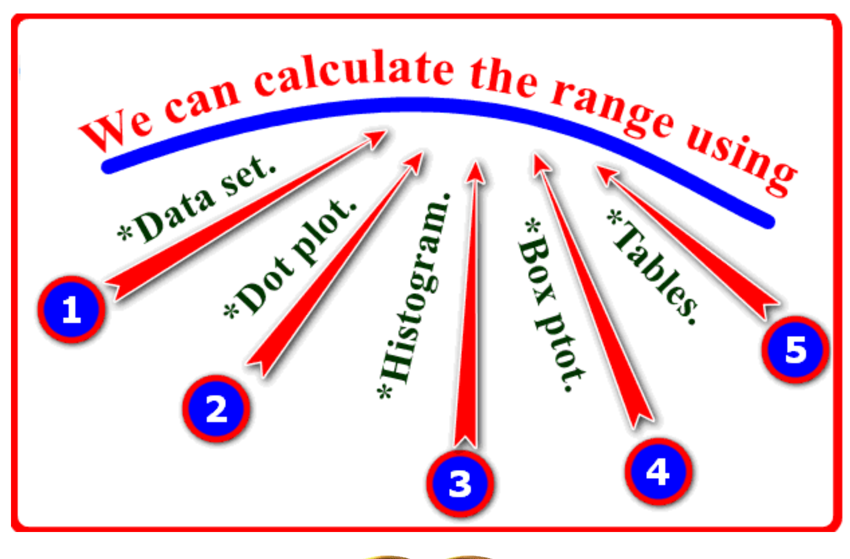




The range :

The range of the data is **the amount of spread** among all the data collected. This value is calculated by finding the **difference between the maximum and minimum** data values.

For Example: The range of the set of values 9 ,4 ,6 ,1 ,7 is $9 - 1 = 8$

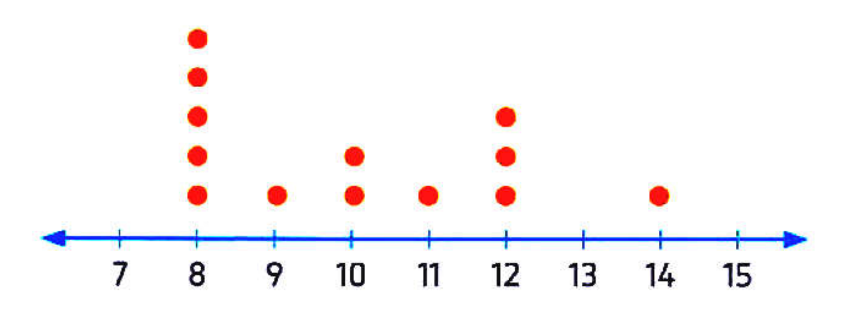


1. Find the range of each of the following:

(1) The data set of values 6 ,7 , 5 , 1 , 9 ,12 , 3 ,4 ....

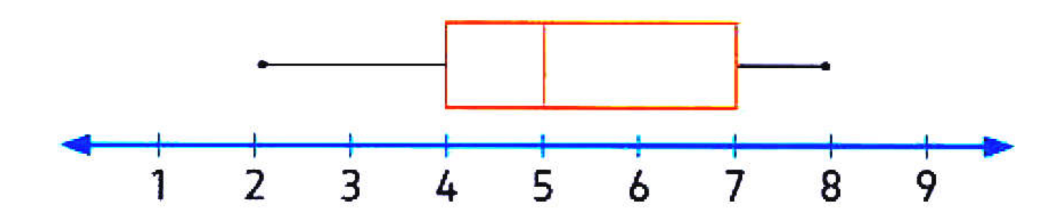


(2) The dot plot Rang=..........................





(3) The Box dot. Rang=..........................



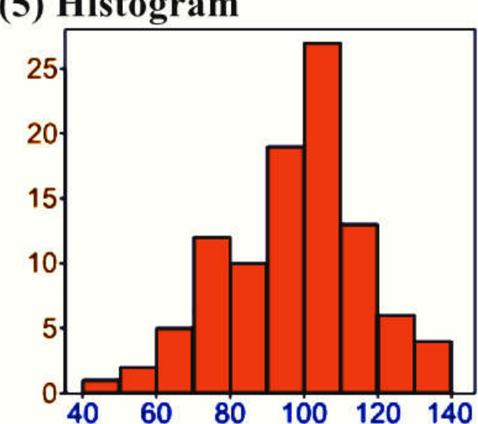


(4)table:

Age of student	Number of students
9	50
10	63
11	41
12	99
13	75

Rang=..........................

(5) Histogram



Rang=.........................



Choose the correct answer:

(1) The range = greatest value..... smallest value.

a) + b) − c) × d) ÷

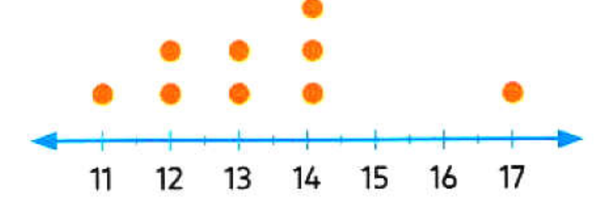
(2) The range of the set of values 7 , 3 , 6 , 9 and 5 is ——

a) 3 b) 5 c) 4 d) 12

(3) If the values of data set start from 30 to 60, then the range of this data = ——

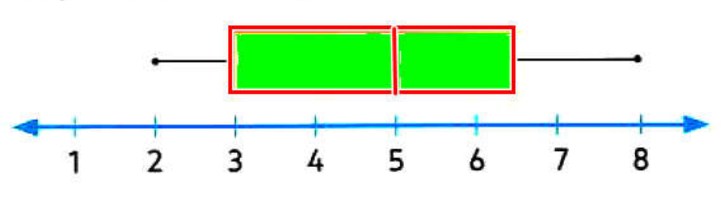
a) 20 b) 30 c) 60 d) 90

(4) The range of data set represented by the following graph is ——



a) 7 b) 6 c) 11 d) 17

(5) By using the following box plot, the range = ————



a) 3 b) 5 c) 6 d) 7

(6)

The range of the quiz scores ?

Quiz number	Score
1	78
2	80
3	69
4	54
5	63
6	65
7	71

a 7 b 26 c 54 d 80



Homework

1. Complete the following.

a. In the opposite box plot, the range = ________



b. If 50 is the greatest number of data set and the range = 10, then the smallest number of this data set equals ________

c. The balanced point of data set (7, 8, 10, 10, 11, 12, 12) is ________

d. The mode of the following data set (4, 7, 4, 6, 4, 9, 4, 11, 7) is ________

e. The greatest negative integer is ________

2. **Choose the correct answer:**

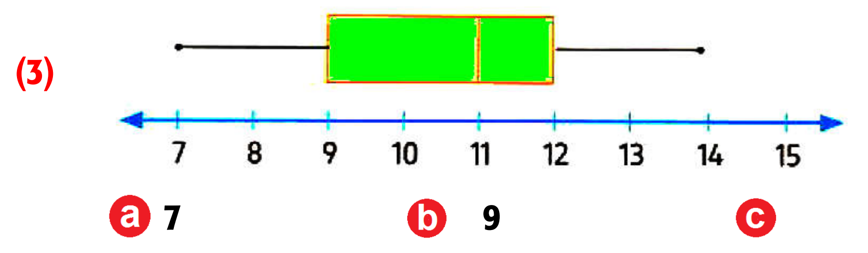
(1) The range of the set of values 7, 3, 6, 9 and 5 is….

ⓐ 2 ⓑ 3 ⓒ 4 ⓓ 6

(2) If the values of data set start from 10 to 35, then the range of this data =

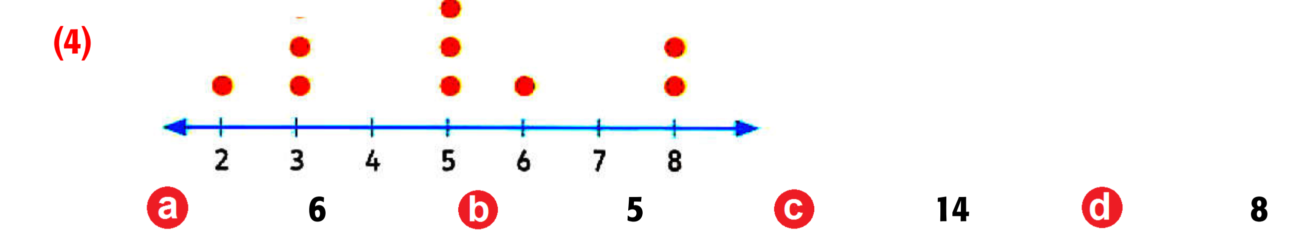
ⓐ 10 ⓑ 15 ⓒ 25 ⓓ 45

(3) By using the following box plot, the range =…..



ⓐ 7 ⓑ 9 ⓒ 11 ⓓ 15

(4) By using the following dot plot, the range =…..



ⓐ 6 ⓑ 5 ⓒ 14 ⓓ 8

(5) The range of the numbers 19, 14, 9 and 2 is…………

ⓐ 2 ⓑ 9 ⓒ 14 ⓓ 17

Unit (7) Assessment

[1] Choose the correct answer:

1. The mean of the data set {9 , 19 , 12 , 10} is ....
   A. 10 B. 12 C. 12.5 D. 15.5

2. The balance of the following data set 17 , 18 , 20 , 20 , 20 , 21 , 21 , 21 , 22 is ....
   A. 18 B. 20 C. 20.5 D. 21

3. The mode of 7 , 9 , 7 , 8 , 7 , 6 , 7 , 10 is ....
   A. 7 B. 8 C. 9 D. 10

4. The better measure of central tendency for the following data set is ....
   A. mean B. median
   C. either

5. The outlier value of the following data set is ....



25 | 27 | 24 | 94 | 21 | 22 | 26

   A. 21 B. 27 C. 49 D. 94

6. What is the range of the following data set ?
   A. 4 B. 3
   C. 5 D. 7

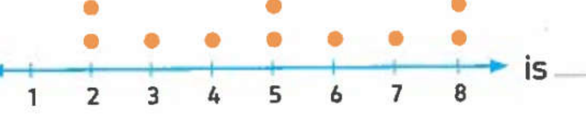
3 4 5 6 7 8

7. The range of the set of values 9 , 4 , 6 , 1 , 7 is ....
   A. 9 B. 8 C. 7 D. 6



[2] Complete:

1. The .... = the greatest value – the smallest value.
2. .... is the middle value of the data set
3. The values that lie outside most of the other values in a set of data called ....
4. The mode of 6 , 4 , 2 , 9 , 4 , 3 , 7 , 6 , 4 , 5 , 4 is ....
5. The average of 3 , 4 , 6 , 6 , 7 , 8 , 8 is ....
6. The median of the following data which is represented by the dot plot

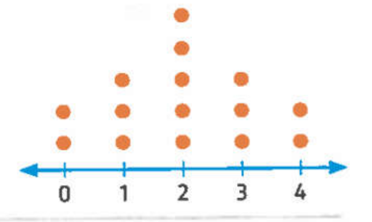


is ....

[3] Find:

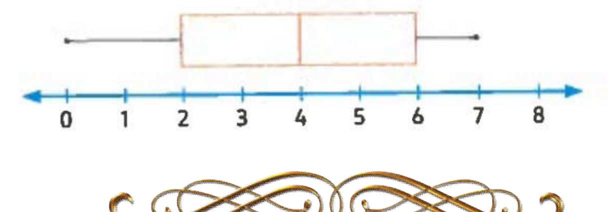
Answer the following :

1. By using the opposite dot plot find :
   a. The mean b. The median
   c. The mode d. The range



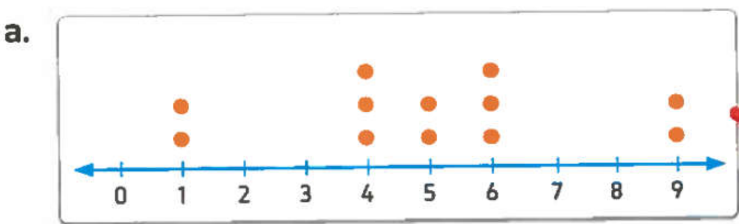
2. Wael runs 3 km on Saturday, 5 km on Sunday, 4 km on Monday, and 4 km on Tuesday. **Find the mean distance covered by Wael.**

3. Sameh drew a box plot to show the number of times that students play music last month. **What is the range of the number of times play music.**

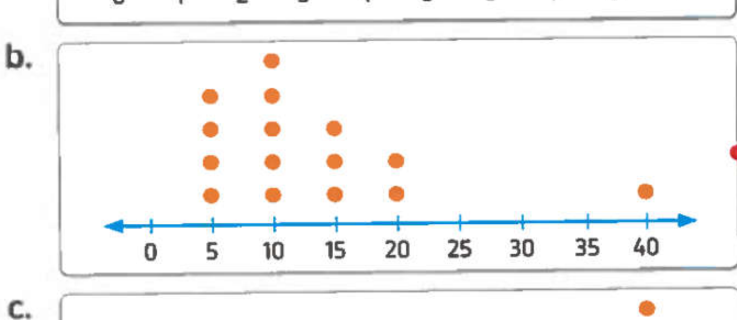


Choose the suitable descriptions with the related graph about the effect of outliers on the mean.

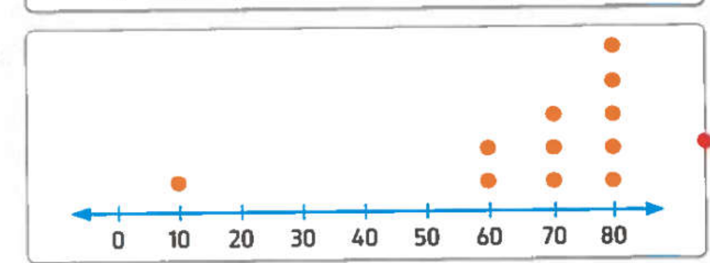
a.



b.



c.



- Mean increases
- Mean decreases
- Mean stay the same

Best Wishes